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DOSE STANDARDIZATION OF PITUITARY GLAND EXTRACT FOR THE INDUCED BREEDING OF INDIAN MAJOR CARPS

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Abstract. Three Indian major carps, *Labeo rohita*, *Cirrhinus mrigala*, and *Catla catla*, were commercially exploited for seed production through hypophysation at Gujartal Fish Farm, Jaunpur, U.P., Uttar Pradesh Matsy Vikash Nigam. In the present contribution an attempt has been made to standardize the exact doses of Pituitary Gland extract (PGE) for getting the best results. On the onset of spawning period, several experiments were conducted from lastweek of June to the first week of August. The best results were obtained during heavy rains after applying the standardized doses of PGE within a temperature range of 28.0 to 33.0°C.

INTRODUCTION

Three major carps, *L. rohita*, *C. mrigala* and *C. catla* have been widely exploited on commercial basis throughout India. Hypophysation is the best method to get pure seed. Uttar Pradesh Matsya Vikas Nigam (UPMVN) is a leading institution in India which has several hatcheries and fish farms for carp seed production and supplies seed to fish farmers through state fishers department and fish farmers developmental agencies. The Nigam had one of its spectacular farm at Gujartal, Jaunpur under its supervision in 1983 where carp seed was produced for distribution among farmers. While acting as a Farm Incarge, the senior author (AKD) found it essential to standardize the doses of PGE for different major carp species to avoid hindrance in the process and wastage of brooders. He conducted several sets of experiments from the last week of June to the first week of August and was able to standardize successfully the PG doses and other suitable environmental conditions at Gujartal.

The techniques of induced breeding of major Indian carps have been reviewed by Alikunhi et al. (1960), Chaudhury (1963), Bhimachar & Tripathi (1967), Jhingran (1969), Chonder (1970), Shchadch (1970) Moitra & Sarkar (1978) and Dobriyal (1986).

MATERIAL AND METHODS

Major carps brooders were selected from the stocking ponds after essential precautions and the fish were paired in the usual ratio of 2 males : 1 females. Pituitary glands were freshly dissected out from

Hypophthalmichthys molitrix because preserved glands could not better results. The required quantity of gland was taken out of phials at the time of injections. The alcohol was properly evaporated before the maceration of glands with a tissue homogenizer in destilled water. Further dilution was made to render the total solutes at a rate of 0.2 ml/kg body weight. The PGE was then centrifuged and supernatant was drawn into a hypodermic syringe for injection. The injections were always given intramuscularly with B. D. needle No. 22. The first injection was given in the late evening hours to females only while the second injection was given after about 5 hours to both males as well as females.

Table 1. Standardized doses of Pituitary gland extract for different Indian major carps

Fish species	Sex	First dose (mg/kg body weight)	Second dose (mg/kg body weight)
Labeo rohita	Male	Nil	4.0
L. rohita	Female	4.0	7.5
Cirrhinus mrigala	Male	Nil	3.0
C. mrigala	Female	3.0	6.0
Catla catla	Male	Nil	3.0
C. catla	Female	2.5	5.5

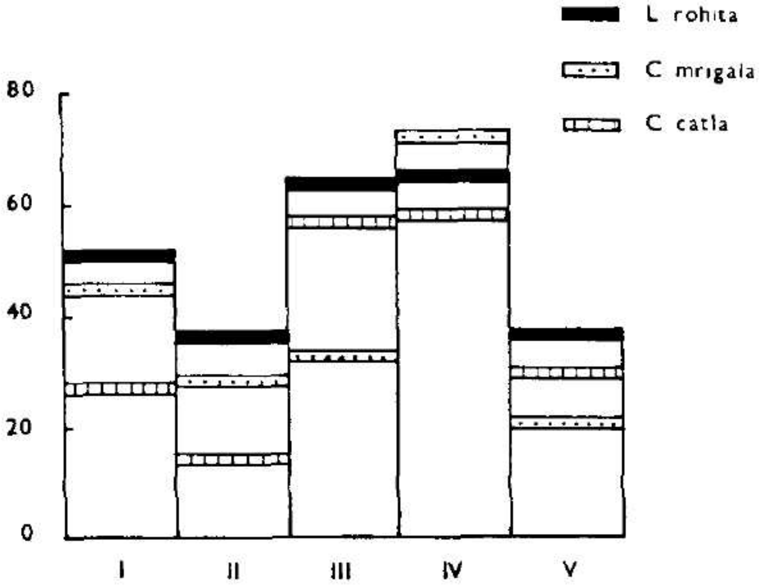

Fig. 1. Overall results of six selected sets of experiments on the induced breeding of 3 indian major carps (I - numbers of female injected, II - numbers of female spawned, III - fecundity (Lacs), IV - percentage of fertilization, V - hatchlings produced (Lacs)

OBSERVATIONS AND DISCUSSION

On the onset of the spawning period, several experimetns were conducted from the last week of June and the PGE doses could finally be standardized (Tab. 1) in the second week of July. The breeding was made continuous up to the first week of August. During the whole period a total of 301 specimens weighing 480.8 Kg (rohu 117, 176.4 kg; mrigal 159, 197.7 kg; catla 25, 106.7 kg) were tried for induced breeding, but only six sets of experiments with supporting conditions (Tab. 2) were selected for the purpose of present communication which contained a total of 120 specimens weighing about 199 Kg (Fig. 1).

Table 2 Results of six selected sets of experiments conducted on 3 Indian major carps

Date of Exp	Fish species	Water Temp (°C)	Females injected No.	Wt (kg)	Weather	Females spawned	Fecundity (Lacs)	Percent fertilization	Hatchlings produced (Lacs)	Remarks
9.6.83	*L. rohita*	36	6	8.5	cloudy	2	3.4	50	0.95	PGE doses
	C.mrigala		6	5.6		1	0.9	60	0.26	were less than
	C. catla		2	5.2		0	-	-	-	standards
4.7.83	*L. rohita*	32	10	16.0	conti-	4	7.6	65	3.2	PGE doses
	C.mrigala		8	9.6	nuous	4	4.6	70	2.6	were more than
	C. catla		4	11.0	rains	2	7.4	50	3.1	standards
12.7.83	*L. rohita*	28	16	22.5	conti-	15	26.4	80	18.4	standard PGE
	C. mrigala		16	17.6	nuous	12	14.6	80	10.2	doses were
	C. catla		8	21.0	rains	4	17.2	70	10.4	used
19.7.83	*L. rohita*	31	8	13.6	conti-	8	13.6	70	7.4	
	C. mrigala		6	7.8	nuous	6	7.9	75	5.1	do
	C. catla		6	15.6	rains	5	21.6	60	10.2	
26.7.83	*L. rohita*	33	6	8.4	driz-	4	7.4	60	3.1	
	C.mrigala		4	5.6	ling	3	2.8	70	1.3	do
	C. catla		4	14.4		2	9.0	50	3.6	
2.8.83	*L rohita*	35	4	5.6	cloudy	2	4.1	55	1.6	do
	C.mrigala		4	4.8		1	1.0	70	0.25	
	C. catla		2	7.2		0	-	-	-	

In the first set of experiments, when the sky was cloudy on 29-6-83 and PGE (Pituitary gland extract) doses were however than standards, the percentage of spawning was low (rohu 33.3, mrigal 16.67%, catla nil). In the second selected set of experimetns (4-7-83) though it was raining heavily, the spawning percentage still low as the PGE doses were not standard (rohu 40%,mrigal 50%, catla 50%). The third selected set of experiments (12-7-83) was a grant success when standardized PGE doses were administered in rainy atmospheric conditions producing better spawning percentage (rohu 93.7%, mrigal 75%, catla 50%). In the fourth selected set of experiments (19-7-83) when standardized PGE dose were used during heavy rains under optimal thermal conditions (31°C), the bes results were obtained (rohu and mrigal 100%, catla 83.3%). Thereafter, even the standard PGE doses could not better results due to imperfect environmental conditions.

The environmental parameters like water temperature, light, weather conditions and rain fall are known to play an important role in stimulating breeding in fishes. In the present investigation in was observed that although the Indian major carp gave bette response to hypophysation at a temperature range of 28 - 33°C (Fig. 2), the best results were obtained at 31°C (rohu 100%, mrigal 100%, catla 83%). The influence of wate temperature on the breeding of fish have been studied by several investigators (Hoa, 1959, Chaudhury, 1960) who also observed that there is an optimal temperatur range and critical temperature limit for induced breeding of cultivated fishes. The India major carps are observed to breed within a temperature range of 24 to 31°C by Kha (1945) and Chaudhury (1960). Ibrahim et al. (1968) reported that induced

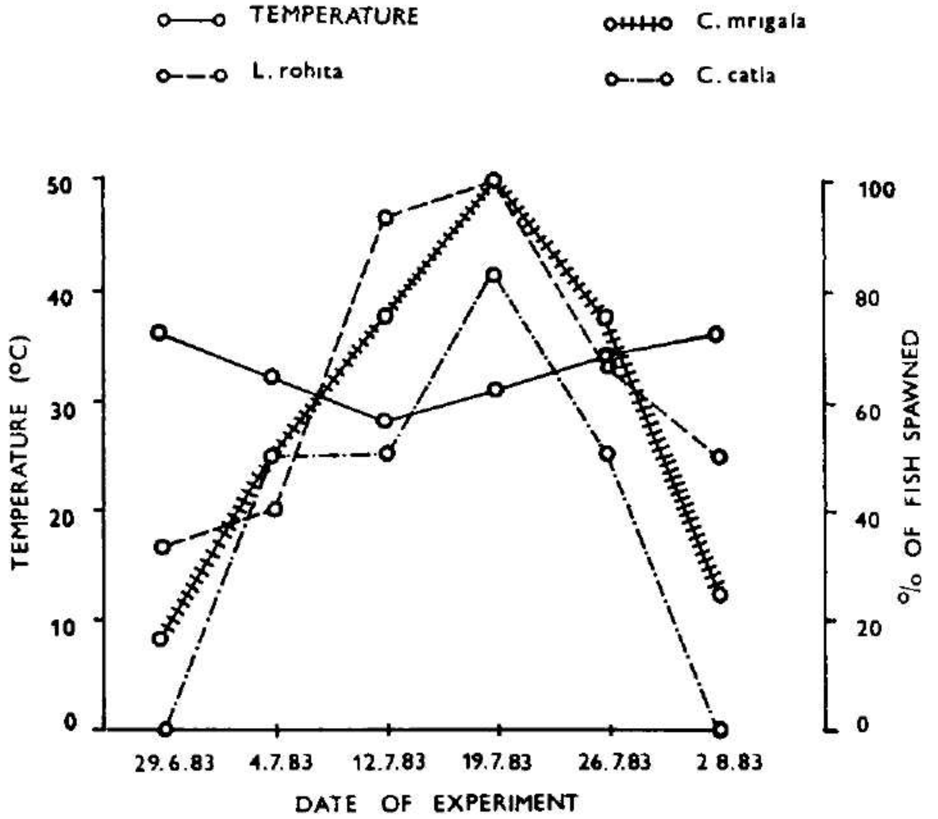

Fig. 2. Correlation between water temperature and percentage of fish spawned.

spawning of 391 sets of catla, rohu a mrigal was successfully conducted at a wider temperature range of 25.5 to 35°C.

Interpretation of the data (Tab. 2) showed that besides temperature, the raining water and flooded condition of pond were also an essential factor triggering spawning in these carps. Chaudhury (1960) also reported that successful spawning in majority of fishes has been induced in cloudy and rainy days, especially after heavy showers.

Thus the present study concludes that a consortium of all the factors, like standardized PGE dose, optimal water temperature and rain showers, is responsible for better results of *major carp hypophysation.*

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BOOK REVIEW

Wyler D. J. (editor): *Modern Parasite Biology. Cellular, Immunological and Molecular Aspects.* W. H. **Freeman**, New York 1990, 428 pp. Price (soft cover) Lstg. 32.95

As the editor emphasizes in the preface, medical parasitology has undergone remarkable developments in the last three decades. New technologies - notably, cultivation in vitro, improved methods of protein analysis, production of monoclonal antibodies, creation of lymphocyte clones and hybrids, and cloning of parasite genes were applied. The volume consists of three parts. Each part is introduced by a balanced overview of the editor. The first part is concerned with the cell biology of parasites namely with biochemistry, electron microscopy and cultivation methods. The second part provides insights into immunology of parasites. The editor points out the unique character of parasite immunology emerging from a heterogeneity of parasite biology. The third part reviews the advances in knowledge of molecular biology of parasites as the youngest basic-science discipline applied to the study of parasites and parasitic diseases.

The contents of chapters is structured according to personal conception of individual contributors rather than according to an unique scheme. Each chapter is concluded by a list of up-to-date references suggested for additional reading, and at the end of the book there is an extra list of primary source papers. There are about 100 drawings, photographs and tables. Protozoan parasites are presented prominently: malarial plasmodia, *Toxoplasma gondii*, leishmaniae, trypanosomes and the dysentery amoeba. Metazoan parasites discussed here are schistosomes and filariae only. The presented volume offers a compendium of reviews of the most active areas of research in medical parasitology. It will be of considerable value as supplement to standard textbooks of parasitology and biology.

J. Jíra

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SEASONAL CHANGES IN LOCOMOTOR AND FEEDING ACTIVITY PATTERNS IN STOAT (MUSTELA ERMINEA, CARNIVORA) IN CAPTIVITY

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Abstract. Seasonal changes in locomotor and feeding activity in a captive female stoat (*Mustela erminea*) were recorded by a photocell system and one-way-door mechanism at the Max-Planck-Institute in Andechs, FRG under natural conditions (LD cycle and weather). Spontaneous changes among unimodal, bigeminus and alternans activity patterns were found. During late spring and summer the locomotor and feeding rhythms appeared independent of each other. The length of activity time was synchronized by the time of sunset and sunrise. Peaks of high regularity of feeding and locomotion occurred close together after sunset and before sunrise. The lowest amount of feeding activity occurred during winter months and the highest peak appeared in September. Rhythms of both activities showed almost the same phase and pattern during fall and winter. The late spring and summer, a time space for locomotor activity was available during which the animal could meet ecological or behavioral needs. In contrast, in winter and early spring when energy demands were high nearly all activity was related to feeding.

INTRODUCTION

Analysis of time exploitation of the area containing food resources requires information on phase of rhythms of activity in consumers and on the availability of food. In the case of predation, data on activity patterns of both predators and their prey are essential. The distribution and occupation of the time niche is a very complicated process requiring knowledge about locomotor and feeding rhythms on a daily, seasonal, and annual basis. Determination of daily activity parameters of animals in captivity, as related to their utilization of food, can provide valuable information for evaluation of the time niche.

Periodic availability of food is known to affect circadian rhythms. The existence of a feeding oscillatory system has become a matter of recent interest (Aschoff, 1986; Gänshirt et al., 1989; Subbaraj & Gwinner, 1985). Further, it is well known that there are seasonal changes in the relative influence of synchronizers on rhythms of activity (Aschoff, 1969; Hoffman, 1969).

If one assumes that both locomotor and feeding oscillators have the same sensitivity to the LD cycle, they will maintain the same phase relationship to sunset and sunrise. In addition, the phase angle between the rhythms should remain stable throughout the year. However, if the LD synchronizer is strong and /or weak enough, the rhythms could have different phase angles at different times of the annual cycle. To follow the possible responses of both rhythms to the nLD cycle was the main interest.

METHODS

Food consumption and locomotor activity of a captive adult female stoat were studied in Andechs, FRG (47 58'N, 11 30'E) from November 1, 1968 until September 31, 1969. The stoat was kept in a outdoor circular 12 x 2 m pen with a sand floor. The walls were nontranslucent laminated glass to prevent disturbance from the outside and the top was covered with wire netting.

The pen obtained a sleeping box (30 x 30 x 15 cm) with two 7 cm aluminium tubes with one-way doors. One tube allowed entrance to the nest box and the other allowed exit. The time the stoat spent in the box was considered rest time and the time out of the box was considered activity time. Occasional visual observations of the stoat confirmed these activity types.

Foraging was monitored by interruption of the beam of a photocell placed at the 5 cm diameter entrance to the feeding box (12 x 12 x 8 cm). Food was provided ad libitum at different times of day. During the first month dead chickens and mice were used for food. However the stoat pulled these out of the feeding box and consumed them in the pen. Therefore, the food was changed to homogenized meat mixed with raw egg and vitamins which the stoat could only obtain by interrupting the beam of the photocell.

ANALYSIS

The rhythm of feeding activity was determined by modification of the method reported by Müller & Schreiber (1967), in which the percent deviation of the monthly average value was calculated for one hour intervals (Figala, Tester & Seim, 1984). Precision, or stability, of the foraging rhythm was calculated using the coefficient of variation ($C_{\bar{x}} = \frac{s}{\bar{x}} \cdot 100$) for each hour of the 24 hour cycle for a given month.

The time within the 24-hour cycle when the amount of feeding increased sufficiently to rise above the threshold line was selected as the onset of food intake. Similarly, the time when feeding fell below the threshold was selected as the time of cessation (Figala & Muller, 1972). Bimodal rhythms were characterized as bigeminus when the first peak was higher than the second, and as alternans when the second peak was higher (Aschoff,1962).

During the 11-month period we collected over 15,800 records of locomotors and feeding activity.

RESULTS

1. Daily and Seasonal Pattern of Feeding and Locomotor Activity

Patterns of locomotor and feeding activity in successive months represent the relative amount of activity for each hour. Locomotor activity occurred mainly during night hours throughout the 11-month period. A small amount of locomotor activity (Fig. 1) was recorded during daylight, but this activity did not reach the average monthly threshold.

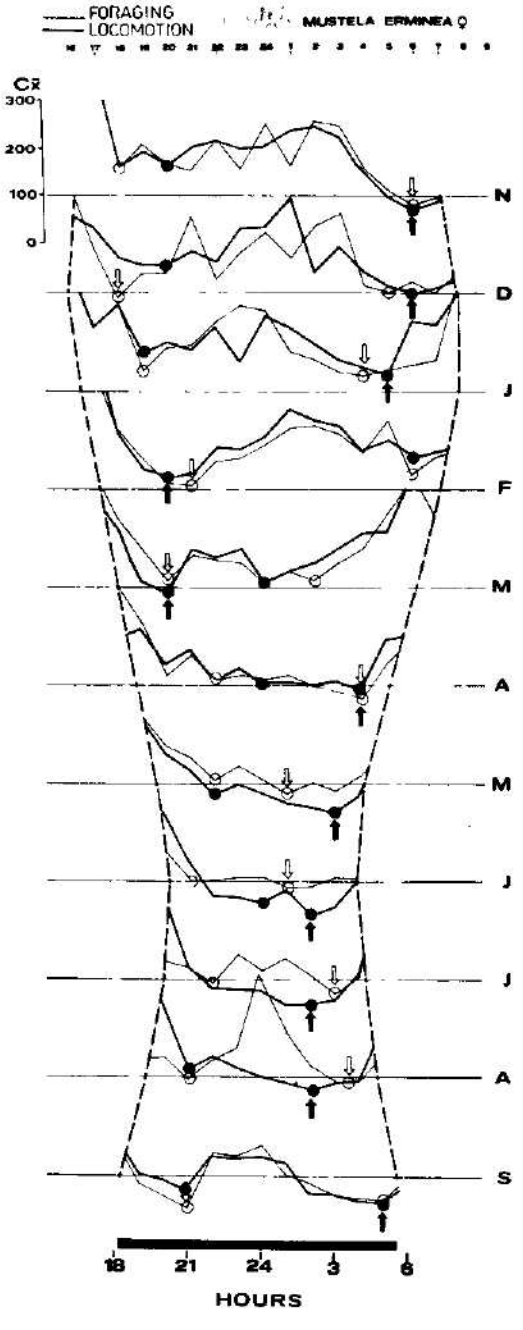

Fig. 1. Monthly changes in feeding (thin lines) and locomotor activity (thick lines) in a stoat female. The horizontal curves show percent duration from the monthly average for each hour and the curved vertical lines indicate sunrise and sunset.

Most feeding activity also occurred at night. However, form March through August, a feeding activity also occurred during the day with a small peak shortly before noon.

The most common feeding rhythm had the alternans pattern, and occurred in summer, fall and the first half of winter. The typical alternans pattern for locomotor activity was observed from November through January, and in May and September. A striking change in activity patterns for both locomotion and feeding occurred during February and March, when the bigeminus pattern became common. The unimodal pattern in both locomotion and feeding began to appear in April. During May the bigeminus pattern changed into an alternans pattern in both rhythms. A tendency for splitting is shown in both rhythms in June. The locomotor rhythm had a unimodal pattern which became more pronounced in July and August in contrast to the pattern of the feeding rhythm, which was typical alternans. During September both rhythms again became alternans and exhibited the same phase angle.

Rhythms of locomotor and foraging activity were both synchronized by sunset and sunrise during the 11-month period. The lengths of both activities followed the length of the night period, and had the same pattern except in late spring and sommer. In April the main peak of feeding activity occurred near the time of activity onset, shortly after sunset. On the other hand, the highest peak of locomotor activity occurred after midnight.

2. Daily and Seasonal Variations in Feeding and Locomotor Activity

The average variation in feeding and locomotor activity calculated for each hour. These values were extremely high during daylight. Therefore, only data obtained during the activity time between sunset and sunrise are presented (Fig. 2).

Variability in feeding activity (thin line) and the locomotor activity rhythms (thick line) was mostly parallel during the 11-months. The most regular food intake (open circles) occurred shortly after midnight or in early morning. The lowest variability in locomotor activity (thick line) occurred during the same hours. A secondary minimum in both variabilities occurred shortly after sunset. In February and March the main minimas of variation occurred after sunset, apparently in response to the change in the activity pattern. Open arrows indicate the lowest values of feeding variability and black arrows indicate the lowest values for locomotor activity.

Number of passages into the feeding box, calculated as a daily average for each month varied from 100 in January and February to 400 in September. A seasonal increase was recorded from February through June, as the photoperiod increased.

In July and August a slight decrease occurred in the range of passages. This decrease correlated with the decrease in length of the photoperiod. The maximum number of passages occurred in September (October days are missing), indicating a changing influence of exogenous factors. During November and December, the number of passage decreased to the lowest values recorded in the study.

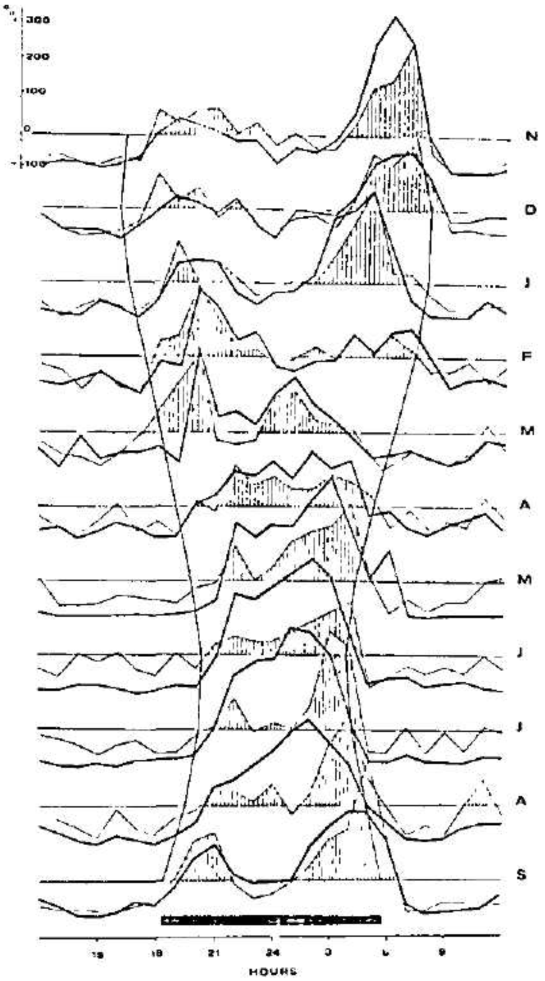

Fig. 2. Monthly changes in the variability of feeding activity (thin lines) and locomotor activity (thick lines) in a stoat female. The minimum values of the feeding activity after sunset and before the sunrise are indicated by the circles. White arrows indicate the lowest values of feeding variability during the night. Similar parameters concerning locomotor activity are indicated by black circles and black arrows.

DISCUSSION

Food intake in the captive stoat reflects true feeding activity because the food was served in homogenized form, which could only be eaten directly from the container. Müller (1970) reported on the influence of different types of food on the feeding activity of stoats in captivity. He observed a reduction in length of the activity period following days after the stoat has consumed a large animal.

The small amount of activity during daylight recorded in this study was also observed in free-ranging stoats (Debrot & Mermod, 1983). Erlinge & Widen (1975) analyzed movements of free-ranging stoats monitored by radio telemetry and found that *stoats must forage 2-3 hours every day. Female stoats used a variety of small prey species* Erlinge (1981) believed that the ideal food for male stoats was large rodents, especially *Arvicola terrestris*. The longevity of feeding activity depended on the amount of food eaten. Erlinge & Sandell (1986) noted seasonal shifts in social organization in male stoats, from territorial to non-territorial, during spring and summer. They believed that this change was correlated with the beginning of the reproductive season. The type and amount of sexual activity changed in spring, especially during March and April (Debrot & Mermod, 1983). Higher levels of activity were found in males than in females; males were more active during daylight than females, probably due to migration into new territories and protection of these territories (Erlinge, 1977). Reproduction occurred primarily in June, July, and August (Debrot & Mermod, 1983), but may occur in April (Sandell, 1968) or May (Ternovskij, 1977).

Sandell (1989) reported that in February all activity of both male and female stoats involved hunting for prey, i.e., both phase and pattern of locomotor and feeding activity were identical, as in our data. During June Sandell's stoats were primarily day-active and all locomotion by females was related to hunting. We believe that this pattern, which differed from the pattern we observed, was related to care of young.

This brief summary reveals that information on feeding and locomotor activity in free-ranging stoats is sparse. Our data from captivity show that the locomotor rhythm had almost the same phase as the feeding rhythm during the observation period. The alternans pattern of activity is not common in mammals. However, it has been reported for several day active mammals (*Giraffa camelopardalis*, Innis, 1958 and *Zalopus wollebaeki*, Eibl-Eibesfeldt, 1955) and in the feeding rhythm of adult black rats (*Rattus rattus* Figala, 1965). We do not have an ecological explanation for the abrupt shift from the alternans to the bigeminus pattern during February and March. The spontaneous shift might be related to the reproductive season or to territorial changes.

Hilmer & Tembrock (1972) reported seasonal changes in the amount of activity in 3 fox species, with the greatest changes occurring in the reproductive period. The seasonal changes we observed in the amount of locomotor activity in the stoat female were not influenced by mating activity or by nursing. During the first half of the year we found a negative correlation length of photoperiod. We do not know the reason for the activity peaks in September and November.

The phase of both rhythms changed during April, modulating into two different actvity patterns, bigeminus for feeding and alternans for locomotion. We believe that these different activity patterns might be entrained by separate oscillators; one for feeding activities and the second for locomotor activities. **Both oscillators could have a different** seasonal sensitivity to exogenous Zeitgebers.

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BOOK REVIEW

Schad G A, Warren K S (editors) *Hookworm Disease Current Status and New Directions* Taylor & Francis, London, New York, Philadelphia, 1990, 438 pp Cloth Price Lstg 60 00, US Dollars 120

An identically entitled meeting was held in Italy in 1988 This volume represents a team work of 30 international experts and consists of eight parts The first part gives a historical introduction The second part is concerned with regional status of hookworm infection and disease The third and fourth parts review the advances made in biological knowledge of hookworms and strategies for hookworm control In the fifth part human ancylostomiasis and its consequences are discussed The sixth part focuses on the treatment prevention and control, on present status and future problems of chemotherapy and some immunological data Discussed also is the technology of sanitary systems for prevention and control purposes in rural regions The seventh part deals with immunobiology and molecular biology The eight part concludes with an overview perspectives of clinical practice

Up to now ancylostomiasis still remains a highly prevalent parasitic infection that affects about 20% of the world's population Surveys conducted in most tropical countries revealed prevalence of more than 50% It ranks as one of the most important diseases in regions with warm and moist climates In addition to, or in combination with malnutrition and malaria, it is a frequent cause of human misery and economic losses The publication presents knowledge intended for promoting renewed research initiated by the Rockefeller Foundation, and informs on the current status of hookworm disease and its basic, applied and clinical investigation

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AGE AND GROWTH OF THE ROACH (RUTILUS RUTILUS, PISCES, CYPRINIFORMES) IN THE SLAPY RIVERINE LAKE (CENTRAL BOHEMIA)

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Abstract The data concerning the age, length and weight growth of the roach (*Rutilus rutilus* L., 1758) in the Slapy riverine lake 1985-87 using 7619 specimens at the age from 0+ upto 9+ are presented Equations after von Bertalanffy, length-weight relationship and Fulton' coefficient were calculated The phenomenon of R Lee was also analyzed Differences between both sexes were discussed The growth rate of the roach from Slapy riverine lake is compared within the period 1957-58, besides, the differences in the growth in various stagnant waters in Czechoslovakia are given The influence of plerocercoids of *Ligula intestinalis* on growth of the roach is mentioned, too.

INTRODUCTION

The roach, *Rutilus rutilus,* belongs to the most common and abundant species of Czechoslovak waters. The length growth of the roach in Czechoslovakia was up to present time studied by many authors, e.g. Balon (1955), Frank & Vostradovský (1961), Frank (1962, 1979), Lelek (1965), Holčík (1967), Cabejšek & Frank (1968), Vostradovský (1965, 1968), Pivnička (1972, 1974, 1975, 1982, 1983, 1984), Chitravadivelu (1974), Oliva et al. (1979), Černý (1980), Losos, Peňáz & Kubíčková (1980), Křížek (1981), Hanel (1982, 1987, 1988), Justýn et al. (1985), Benešová & Závěta (1987), Pivnička & Švátora (1988), Švátora & Pivnička (1989).

The growth of the roach in the Slapy riverine lake was studied by Frank (1959, 1961), Oliva & Frank (1959), Holčík (1961) and Hanel (1969 a).

Outside Czechoslovakia, data about the roach are summarized in papers by Benešová & Závěta (1987) and Pivnička & Švátora (1988).

The basic data about the Slapy riverine lake were summarized in a separate paper (Hanel, in print).

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MATERIAL AND METHODS

The specimens under study were obtained using nets (further details see Hanel, in print) in the Slapy riverine lake. Young of the year was caught in following localities Psané skály (Aug. 12, 1985, n = 648, June 30 1986, n = 4201; Aug. 4, 1986, n = 827; July 6, 1987, n = 204), Nová Živohošť (Oct, 12, 1985, n = 19; July 19 1987, n = 17; Aug 22-28, 1987, n = 8) Elder specimens were caught in the following three localities: Stara Živohošť (May 18, 1985, n = 258, males = 26), Nová Živohošť (Oct. 12, 1985, males n = 68, without sex determination n = 235; June 21, 1986, males n = 37, females n = 141, without sex determination n = 443; Oct 11, 1986, males n = 63, females n = 88, without sex determination n = 172; May 16, 1987, males n = 19, females n = 8, without sex determination n = 132), Psané skály (June 30, 1986, n = 5).

The age was determined on the base of the scale structure by the use of the projecting apparatus „Documator Lesegerat DL II" using the 17.5 times magnification In all specimens ventrodiagonal radius of the scale was measured. The Rose Lee's method was used with the correction value of 18 mm Černý, 1980) The back calculation of the weight was performed using the method following Rounsefell & Everhart (1960). The length growth evaluation was made by the use of the growth characteristics (Hanel, in print). The weight growth was compared using index of the production (see Pivnička, 1972) The Fulton's coefficient (KF) was calculated using the common formula (see Hanel, in print). The phenomenon of Rosa Lee was analyzed by the use of the method described by Hanel (1982)

RESULTS AND DISCUSSION

Length Growth

Body lengths of young of the year (YOY) of the roach from the Slapy riverine lake are given in Table 1. The length of the caudal fin decreased with the increasing of the body length, the average equation calculated from the total sample of the roach from the Slapy riverine lake was: TL/BL = 1.2589-0.0008 BL (ranges of the body length 55-290 mm). At the end of the month of August 1985-87 YOY of the roach grew up to the average body length from 41 to 46 mm. These values are in good accordance with the data from the reservoir Klíčava in the year 1983 (Kubečka, 1984). The values found are higher than values from the reservoir Lipno in the year 1964 (Vostradovský, 1965). Frank (1970) has found an analogous variability (using ranges of the body length) in Czechoslovak reservoir Klíčava, Čikova (1966) in the reservoir Kuybyshevsk (USSR) and Krzykawski (1963) in the reservoir Legińske (Poland), too. YOY in the Slapy riverine lake had average body length on Oct. 12, 1985 and Oct. 11, 1968 of 67 mm. This value is higher when it is compared with data from Klíčava reservoir in the year 1983 (Kubečka, 1984) It must be pointed out that the variability of the YOY (expressed as

Table 1 Body length of young of the year of the roach from the Slapy riverine lake

locality	date of the capture	number of specimens	body length mm
Psané skály	12 8 1985	648	40.8 (22 1-50 6)
Nová Živohošť	12 10 1985	19	67 0.(56 0-78.0)
Psané skály	30 6.1986	4201	21 9 (15 5 -27 8)
Psané skály	4.8.1986	827	35.4 (20 0-49 0)
Psané skály	6.7.1987	204	14.8. (12.0-18.0)
Nová Živohošť	19.7 1987	17	21.4 (18.0-25.5)
Nová Živohošť	22.-28.8.1987	8	45 8 (44 0-50.0)

ranges of the body length) was high in some samples examined, e.g. 20-49 mm in th sample caught on Aug. 4, 1986.

The roach material sampled in years 1985-87 without YOY formed 1965 specimens, which can be divided into 10 age groups. The most frequent were age classes 2- (46% in average of the total sample), 3+ (19%), 4+ (16%) and 5+ (13%). The mos frequent were specimens with the body length 110-130 mm (25%) and 190-210 (27% The maximum body length of 290 mm was found in the specimens of the age 9+. Th

Table 2. Average length growth of the roach in the Slapy riverine lake

locality	date of capture	n	l_1	l_2	l_3	l_4	l_5	l_6	l_7	l_8	l_9
Bučily (Frank,1959)	Oct., 1957 rapid growth	21	41	99	153	179					
Bučily (Frank,1959)	Oct., 1957 ave growth	133	36	66	99	128	154	171	185	207	217
Bučily (Frank,1959)	Oct.,1957 slow growth	86	35	62	96	118	137	154			
Cholín (Frank,1959)	Oct.,1857	6	34	60	95	131	136				
Slapy res. (Holčík,1961)	1958 rapid growth	91	43	65	99	134	162	187	200	221	
Slapy res (Holčík,1961)	1958 ave.growth	315	42	62	97	130	161	169	183	201	218
Slapy res. (Holčík,1961)	1958 slow growth	157	42	58	84	115	140	154	165	175	
St.Živohošt'	18.5.1985 (males)	26	48	98	144	179	209				
St.Živohošt'	18.5.1985	258	47	97	139	177	199	216	237		
N.Živohošt'	12.10.85 (males)	68	50	80	95						
N.Živohošt'	12.10.85	235	48	87	131	166	190	204	223	231	
N.Živohošt'	21.6.1986 (males)	37	53	87	128	167	212				
N.Živohošt'	21.6.1986 (females)	141	48	88	130	171	192				
N.Živohošt'	21.6.1986	432	47	89	132	163	187	200	209	205	222
N.Živohošt' +	21.6.1986	11	52	109	152	191	212				
Psané skály	30.6.1986	5	40	59							
N.Živohošt'	11.10.1986 (females)	88	48	89	134	169	182	195	213		
N.Živohošt'	11.10.1986 (males)	63	49	96	143	169	183	200			
N.Živohošt'	11.10 1986	172	48	91	129	160	181	199	213	226	241
N.Živohošt'	16.5.1987 (females)	8	41	71	118	138					
N.Živohošt'	16.5.1987 (females)	19	50	83	112						
N.Živohošt'	16.5.1987	132	52	80	96	105					

+ specimens infested by surface infectious dropsy roach with the biggest length was angled within Czechoslovak waters in the year 1982 in the river Bečva. Its total length was 530 mm (calculated body length 442 mm) and the weight 1.45 kg, the age was unknown. The roach with the biggest weight was angled in the river Labe in the year 1985. Its weight was 2.1 kg and total length 520 mm (calculated body length 433 mm), see Hanel (1987). Concerning maximum age in the roach from Czechoslovakia, Hanel (1982) has mentioned the age 19+ of the roach, which was angled on Nov 8, 1980 in the river Divoká Orlice. Its total length was 400 mm, the calculated body length 33 mm and the weight 0.97 kg. Kovrižnych (1987) pointed out the age 20+ in the roach angled in the rivulet Vydrica (the tributary of the river Dunaj) on Aug. 30, 1983. Its body length was 381 mm and the weight 1.344 kg.

Table 3. Parameters of the von Bertalanffy's equation of the roach from the Slapy riverine lake (l_∞ - the theoretically attainable maximum length, K - the growth coefficient, to - the hypothetical starting age), + specimens infested by surface infectious dropsy

locality	date of capture	sex	l_∞	K	to
St.Živohošť	18.5.1985	males	472	0.117	0.027
St.Živohošť	18.5.1985		342	0.169	-0.0019
N. Živohošť	12.10.1985	males	116	0.569	-0.0014
N. Živohošť	12.10.1985		300	0.190	0.0037
N. Živohošť	21.6.1986	males	511	0.099	-0.020
N. Živohošť	21.6.1986	females	359	0.133	0.048
N. Živohošť	21.6.1986		273	0.212	0.199
N. Živohošť	21.6.1986		421	0.140	0.034
N. Živohošť	11.10.1986	males	269	0.231	-0.0062
N. Živohošť	11.10.1986	females	286	0.204	-0.055
N. Živohošť	11.10.1986		296	0.186	-0.044
N. Živohošť	16.5.1987	females	311	0.146	0.061
N. Živohošť	16.5.1987		116	0.594	-0.0013
the brook Mastník	20.10.1985		215	0.172	0.053

The average length growth of females and males of the roach in the Slapy riverine lake during the periods 1957-58 and 1985-87 is presented in Tables 2 and 3, where the growth model of von Bertalanffy was constructed. The average body length growth of females and males during period 1985-87 was very similar (body length in mm, females n = 229, males n = 213, spec. caught in localities Stará and Nová Živohošť, (females/males): l_1 = 48/50, l_2 = 89/89, l_3 = 132/132, l_4 = 170/172, l_5 = 187/201, l_6 = 195/200, l_7 = 213). Better length growth in females than males of the roach confirmed Balon (1955) in the pond Poltrua and Holčík (1967) in the reservoir Klíčava.

Concerning the length growth, broad variability was found in the roach from the Slapy riverine lake. Specimens with a certain body length (e.g. 189-234 mm) can belong to five age groups and therefore "determination" of the age using only body length is impossible

According to my results it is evident that in one sample of the roach caught in the locality Nová Živohošť it was possible to find specimens with so-called slow, average and also rapid length growth (comparing with data by Holčík, 1961). As a results the average length growth in the material examined in the years 1985-87 was better in comparison with

Table 4. Comparison of the length growth of the roach by the use of the C_{lh} index in some native reservoirs

locality author		$C_{lh(2-4)}$	$C_{lh(2-5)}$	$C_{lh(2-6)}$
Slapy res.1985-87	min.	96	118	138
(own value)	max.	134	159	181
	ave.	107	134	152
Slapy,1957-58	min.	65	85	100
(Frank,1959,	max.	103	100	124
Holčík,1961)	ave.	76	94	109
Lipno res.1960-62	min.	84	118	146
(Cabejšek & Frank,	max.	109	135	161
1968)	ave.	99	129	153
Klíčava res.1964	min.	124	143	153
(Holčík, 1967)	max.	132	154	181
	ave.	128	150	168
Záskalská res.	min.	105	141	155
1974,1977	max.	106	148	173
(Švátora, 1981)	ave.	106	145	164
Orlík res 1981-82	min.	98	130	155
(Benešová &	max.	106	140	146
Závěta, 1987)	ave.	102	135	160
Pastvinská res.1957 (Frank,1959)	ave.	99	121	137
Šance res.,1982-84 (Lojkásek,1987)	ave.	82	98	111
Hostivař res.1979-82 (Pivnička,1984)	ave.	73	90	105
Švihov res.1973 (Pivnička,1974)	ave.	61	84	-
Máchovo jezero artificial pond,1951 (Cabejšek & Frank,1968)	ave.	69	90	-

Table 5. Proofs of phenomenon of R,Lee on samples of the roach from the Slapy riverine lake; average value are given in mm of the body length, $\bar{x}$ - mean decrease in mm per year

Year of catching		age	l_1	l_2	l_3	l_4
1985		(2+)	116	54	108	
1986		(3+)	160	51	98	147
1987		(4+)	6	46	74	94 122
	$\bar{x}$		-4.0	-17 0	-53 0	
1985		(1+)	40	53		
1986		(2+)	382	50	100	
1987		(3+)	20	43	68	117
	$\bar{x}$		-5.0	-32.0		

data by Frank (1959) and Holčík (1961) concerning the same locality. The length growth in the Slapy riverine lake was better in 1957 than in 1958. This fact is probably connected with changes of ecological conditions during the development of the riverine lake (see Pivnička, 1974). The average length growth in the brook Mastník (one of tributaries of the Slapy reservoir) was worse than in the riverine lake (Hanel, 1989).

In Table 5 total average values (in mm) of the Lee's phenomenon in examined material (for the method see Hanel, 1982) are summarized. Own our values are higher than the same phenomenon shown with the roach from the Klíčava reservoir (see Pivnička, 1982). Within periods 1984-85, 1985-86 and 1986-87 we can observe gradual lowering of length growth expressed by the growth index C1h. Average values of this index are summarized in Table 4. Ranges of this index calculated from own material originating from the Slapy riverine lake (1957-87) varied from $C_{1h(2-6)}$ = 100-181. These ranges include ranges of Czechoslovak stagnant waters mentioned (see Table 4).

The average length growth of the roach based on 1695 specimens (males and females together) caught in the Slapy riverine lake in 1985-87 in mm of the body length was: l_1 48, l_2 - 87, l_3 - 127, l_4 - 163, l_5 - 195, l_6 - 202, l_7 -221, l_8 - 221, l_9 - 232.

In Table 4 average values of growth characteristics for various localities are presented. Better length growth using $C_{1h(2-5)}$ than in the Slapy riverine lake was found in reservoir Klíčava, Záskalská nádrž, Orlík, on the other side the worse length growth was found in reservoirs Lipno, Pastvinská nádrž, Šance, Hostivař, Švihov and artificial pond Máchovo jezero.

The comparison of the length growth in the roach within Czechoslovakia and neighboring countries is given by Benešová & Závěta (1987) and Pivnička & Švátora (1988).

The occurrence of the plerocercoids of the *Ligula intestinalis* and their effect on the length and weight growth of the second intermediate host was studied in the Slapy riverine lake. The sample set of the *Ligula* - invaded fish (n=92) was compared with the healthy roach seined at the same site and the same time. The infestation rates were one to nine individuals of the *Ligula* in one fish. The parasites represented 2.3 - 17.3% (6.2% on an average) of the total weight of the fish. The range of the age of the invaded fish was 1+ to 6+; the fish aged 2+ and 3+ prevailed. The infested roach had a markedly sloved length and weight growth (further details see Hanel, 1988 b). The average differences in length growth between healthy and infested roach was in mm of individual age groups as: l_1: -3 mm, l_2: -18 mm, l_3: -31 mm, l_4: -34 mm, l_5: -19 mm, l_6: -4 mm.

Weight Growth

Parameters of the length-weight relationship for the back calculation of the weight from samples obtained in the examined locality are summarized in Table 6. The "b" parameter ranged from 2.4105 to 3.4141; in females it was 3.1648 and in males 2.9899 in average. This

Table 6 Parameters of the body length/weight relationship of the roach from the Slapy riverine lake

locality	data of capture	n	ranges of body length (mm)	a	b
Slapy res (Frank,1959)	Oct ,1957 rapid growth	21		-4 9625	+3 1266
	ave growth	133		-4 7698	+3 0613
	slow growth	86		-4 6261	+3 3694
Cholín (Frank,1959)	9,10 1957	6		-5 0059	+3 1523
Slapy res (Cabejšek & Frank , 1968)	1958 1968			-5 0328	+3 2022
St Živohošť	18.5 1985 (males)	26	184-235	-4 2120	+2 7862
St Živohošť	18 5 1985	258	168-245	-3 3128	+2 4105
Psané skály	12 8 1985	648	22-47	-4 8359	+3 0554
N Živohošť	12 10 1985 (*males*)	68	83-150	-4 9832	+3 1722
N Živohošť	12 10 1985	254	77-245	-4 5018	+2 9159
N Živohošť	21 6 1986 (females)	141	80-221	-4 5526	+2 9626
N Živohošť	21 6 1986 (males)	37	85-225	-4 4155	+2 8760
N Živohošť	21 6 1986	432	73-255	-4 7335	+3 0225
Psané skály	30 6 1986	4201	16-28	-4 9925	+3 1251
N Živohošť	11 10 1986 (females)	88	120-235	-4 9652	+3 1404
N Živohošť	11 10 1986 (males)	63	120-215	-5 5863	+3 4084
N Živohošť	11 10 1986	176	103-250	5 0389	+3 1657
N Živohošť	16 5 1987 (males)	19	105-157	-4 1012	+2 7067
N Živohošť	16 5 1987 (females)	8	141-188	-5 5286	+3 3913
N Živohošť	16 5 1987	132	66-145	-5 5805	+3 4141

constant "b" indicates that on the average females become heavier than males with increasing length. For the evaluation of the length and weight growth the Fulton's coefficient of condition was calculated. The relationship of this conditional index to the body length is summarized in Table 7. Fulton's coefficient was found to be as increasing or decreasing in various samples in dependence to the body length. In my material I have found ranges of Fulton's coefficient between 1.45-2.76 in males and between 1.93-3.51 in females. The values of individual age groups of the roach from the Orlík reservoir are given in Benešová & Závěta (1987). Within the age from I to IX the average minimum of 1.57 and average maximum of 2.40 was found. These authors summarized values of Fulton's coefficient of the roach from various Czechoslovak localities and abroad.

Table 7. **Relationship betwenn body length and Fulton's coefficient (KF) of the roach from the Slapy riverine lake**

locality	date of capture	sex	equation	r
St.Živohošť	18.5.1985	males	KF = 2.4005 - 0.0021 BL	-0.432
St.Živohošť	18.5.1985		KF = 2.1657 - 0.0006 BL	-0.108
N. Živohošť	12.10.1985	males	KF = 1 8380 + 0.0454 BL	+0.413
N. Živohošť	12.10.1985		KF = 1.9669 + 0.0009 BL	+0.2692
N. Živohošť[1)]	21.6 1986	females	KF = 2.3636 - 0 0021 BL	-0 242
N Živohošť[2)]	21.6 1986	females	KF = 2.4564 - 0.0008 BL	-0.227
N. Živohošť	21.6.1986	males	KF = 2.3753 - 0.0017 BL	-0 255
N. Živohošť	21.6.1986		KF = 2.1685 - 0.0004 BL	-0.102
N. Živohošť	11.10 1986	males	KF = 1 3578 + 0 0430 BL	+0.623
N. Živohošť	11.10.1986	females	KF = 2 2887 - 0.0001 BL	-0.204
N. Živohošť	11 10.1986		KF = 1 6843 + 0.0026 BL	+0.636

[1)] Specimens before spawning

[2)] Specimens after spawning

Table 8. Comparison of the index of production (PI) of the roach among Czechoslovak reservoirs

locality author		PI(3-5)	PI(4-8)
Slapy res.1985-87	min.	164	216
(own value)	max	209	265
	ave.	179	249
Slapy,1957-58	min	52	-
(Frank,1959,	max.	90	-
	ave	71	240
Lipno res.1959-62	min	150	367
(Cabejšek & Frank,	max.	188	644
1968, Frank &	ave.	171	525
Vostradovský,1961)			
Orlík res.	min.	145	213
(Pivnička,1983	max	152	595
(Benešová &	ave	149	404
Závěta, 1987)			
Pastvinská res.1957	ave.	139	-
(Frank,1959)			
Švihov res.	ave.	-	208
(Pivnička,1983)			
Záskalská res.		-	327
(Pivnička,1983)	ave.		
Klíčava res.	ave.	-	203
(Pivnička, 1983)			
Orava res	ave.	-	29
(Pivnička,1983)			

In the period 1957-87, very broad variability of the weight growth was found using th index of the production ($PI_{(3-5)}$) = 52-209. By the comparison of periods 1957-58 an 1985-87 I have confirmed, that on the average the index of production ($PI_{(3-5)}$) at th second period twice higher as compared with the first period. Sufficient fish foo production in the Slapy riverine lake caused probably this fact, regardless to the increas of the roach's biomass. This increase of the share of the roach's biomass in hauls wa evident by comparison of periods 1957-58 and 1985-87. Simultaneously the eviden decrease of bream's population was noted (Hancl, 1989 a). The value of the index o production ($PI_{(4-8)}$) at the roach within Czechoslovak waters rangers between 50-700 (av 200), see Pivnička (1983). From this point of view the roach growth in the Slap riverine lake in 1985-87 was found to be around the mean.

SUMMARY

In 1985-87, the length and weight growth of the roach (*Rutilus rutilus*) in the Slapy riverine lake (Central Bohemia) was studied. The scale method was used at 5924 young o the year and at 1695 older specimens.

Specimens under study represented 0+ to 9+ age classes. The average body length o young of the year during years 1985-87 was at the end of June 22 mm, at the second week of August 41 mm and the second week on the month of October 67 mm. The length growth was very similar in both sexes. The average length growth (using growth characteristics) was worse in the years 1957-58 than in years 1985-87. The von Bertalanffy growth equations for different samples had following parameters: l_∞: 116-511 mm, K 0.099-0.594, t_0: -0.055 to +0.199. The phenomenon of R.Lee was evident. Index of growth characteristics varied in the Slapy riverine lake during period 1957-87 between values $C_{lh(2-6)}$ = 100-181 and concerning index of production between $PI_{(4-8)}$ = 218-265. The population of the roach in the Slapy riverine lake in 1985-87 can be designed concerning length growth and weight growth as growing around the mean found within Czechoslovak reservoirs. The "b" parameter of the length/weight relationship ranged from 2.4105 t 3.4141; in females it was 3.1648 and in males as 2.9899 in average. The roach infested by plerocercoids of the *Ligula intestinalis* had a markedly slowed length and weight growth.

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BOOK REVIEW

Hoestlandt H. (Ed.): *The Freshwater Fishes of Europe. Clupeidae, Anguillidae.* Aula-Verlag, **Wiesbaden**, 1991, 447 pp. 90 tables, 101 figs. Price 236 DM

The book is the second volume of the series "The Freshwater Fishes of Europe" The first volume was divided into two parts, vol.1/I deals with lampreys (Petromyzontiformes, editor J. Holčík, vol. 1/II contents the general introduction to fishes and the order of sturgeons (Acipenseriformes). The editor is the same person. The above mentioned second volume deals with clupeids and eel It was prepared together with the editor in the cowork of several European ichthyologists, namely C Douchements, P S Economidis, J. Gaudant, Ch. W Heckman, M. Karapetkova, F. Kartas, P Kolarov, S.V. Kozlovsky, V.I. Mogilchenko, J. P. Quignard, A I Sinis, F-W Tesch They represent five European and one Northafricau country, Bulgaria (2 authors), France (3 authors) Germany (2 authors), Greece (2 authors), Tunisia (1 author), the former USSR (2 authors). The volume was dedicated to the memory of the late world known Russian ichthyologist, Professor A.N. Svetovidov from the Zoological Institute of the Academy of Sciences in St.-Petersburg, who died on 26th April 1985. His monograph covering clupeids, published in 1952, represented a solid base for the recent monograph. For every species that occurs in Europe a summary of knowledge about systematics and taxonomy, geographical distribution, ecology economic importance and list of literature is given. By this way are described 2 species of the genus *Clupeonella* 6 species of the genus *Alosa*, 1 species of the genus *Anguilla*. With regard to the Czech and Slovak readers most interesting data concern the allis shad, *Alosa alosa*, the Danube shad, *Alosa caspia nordmanni* and the eel, *Anguilla anguilla*. The book is well produced and figures and diagrams are clear. However, I have a small criticism to the map (p. 100) about the geographical distribution of the allis shad, where the former data confirming its presence in Bohemia, published by Frič (1872, 1908) were omitted. The fish penetrated into Bohemia through the river Elbe and the Vltava upto city of Prague The same data are lacking also in the text (p.101). The former opinions about the possibility of upstream migrations of the Danube shad as far as the Iron Gate and still higher upto the Hungary were not substantiated recently and therefore theoretical considerations about the possible occurrence of this species on our territory in the Slovak part of the Danube are not based on the actual material. In the chapter about the eel not pappers of the late Professor K. Schaferna are cited, but the Czechoslovak participation is documented by the common paper of M. Peňáz and F.-W. Tesch (1970) dealing with the sex relationship and the growth of the eel on several localities from the Elbe region, and by the mention of the paper of K. Lohniský (1982), who described the abnormal orange coloration of the single specimen of the eel, caught in the Tichá Orlice in North Bohemia.

The editor, coauthors and the publishing house are to be congratulated on bringing together a very large number of facts concerning both groups of fish in this book, which represents the principal source of informations for all ichthyologists and is also indispensable for anyone interested in ichthyofauna.

O Oliva

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ON THE DIET AND FORAGING ACTIVITY OF WHEATEAR (OENANTHE OENANTHE) IN OLD GRASSLANDS (POĽANA MTS., CZECHOSLOVAKIA)

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Abstract. Sixty five food samples, obtained from 24 nestlings of wheatear in 5 nests, contained 235 food items belonging to 85 species, 47 families and 12 orders of invertebrates. The eudominant items included larval Lepidoptera (Nymphalidae), Orthoptera (*Isophya* and *Chorthippus* spp.) and Coleoptera (Cantharidae), i.e mainly life forms inhabiting the soil surface and the herb stratum. The size of the foraging territory attained 3-5 ha at the density 6-7 breeding pairs per 100 hectares. Parent birds fed their young 11-19 times an hour; of that, the male 7-11 times and the female 4-8 times The paper contains observations on the foraging strategies of the wheatear.

INTRODUCTION

The Wheatear *(Oenanthe oenanthe)* is among the few bird species in Czechoslovakia which inhabit a wide range of habitats from lowlands up to elevations of 2000 m. Wheatears breed in meadows and pastures with scattered heaps of rocks, in Alpine building sites, dumps and wasteland.

Until recently, the trophic ecology of this species has scarcely been studied (e.g. Rjabov 1965) and no data are available from Czechoslovakia. Greater attention has been paid to its foraging strategies and several aspects of its breeding biology (Kneis & Lauch 1983, Moreno 1984, etc).

The objective of our study was to analyse the diet of wheatear nestlings and to contribute to the knowledge of the foraging activity of wheatears during the breeding period.

METHODS AND MATERIAL

In 1989 - 1990, using the neck-ring method, we obtained 65 food samples from 24 young (5-14 days old) in five nests. For young over 10 days old we applied the so-called cotton thread technique to prevent the neck-ringed young from leaving the nest: the nestling was tied by its leg with a cotton thread to the nest cup or to its immediate vicinity.

Wheatear nests were found in heaps of rocks 0.6-0.8 m high. They were situated at an average height of 25 cm from the bottom of the heap. The breeding habitat of the wheatear is represented by old pastures and meadows, diversified by scattered patches of natural successional vegetation and heaps of rocks. Our locality lies on the southern slope of Mt. Pol'ana (central Slovakia) in altitudes of 960-1070 m above sea-level (48°38'N, 19° 28'E). In its environs are discontinuous beechfir-spruce forests. The local population density of *Oenanthe oenanthe* is 6-7 breeding pairs per 100 hectares. The dominant breeders in our locality include *Lanius collurio, Anthus trivialis, Lullula arborea, Emberiza citrinella* and *Alauda arvensis*, less frequent were *Saxicola torquata, Crex crex* and *Coturnix coturnix*.

In quantitative evaluation of the diet composition, we have used dominance of numbers (n%), volume, (V%), frequency of occurrence (%f) and importance index (I, ex Krištín, 1988) of food items. Foraging strategy, frequency of feeding the young were studied from a shelter, using a Dekarem 10x50 binoculars.

RESULTS AND DISCUSSION

Analysis of the Diet

In 65 food samples we identified about 235 items belonging to 85 species 47 families and 12 orders of invertebrates. The markedly eudominant food items (in terms of n% and V%) included Lepidoptera, Coleoptera and Orthoptera; occasional ones, Annelida, Gastropoda, Mecoptera and poisonous Diplopoda (see Review of specimens). The most important component - Lepidoptera - comprised 86.6% larvae, half of which were hairy or spiny forms of the families Nymphalidae, Arctiidae and Lasiocampidae and also Zygaenidae known to contain HCN. It was also interesting to note the occurrence of aposematic adults of butterflies (such as *Erebia* and *Vanessa* spp.), bees (Apidae), hoverflies (Syrphidae); of beetles, Chrysomelidae, Cantharidae and poisonous species of Staphylinidae (see Review of species).

The wheatear consumes invetebrates from 2 mm in size and 2 mm^3 in volume (Aphidoidea) up to 40 mm in length and 1020-1120 mm^3 in volume (*Lumbricus* sp., *Tettigonia viridissima*). The average length of prey is 15.3 mm, its average volume is 1568 mm^3. Compared to the average prey size of e.g. *Troglodytes troglodytes* and *Erithacus rubecula*, this means a relative increase in prey size related to body mass of the predator (*E. rubecula*: 1 = 8.36 mm, V = 28.5 mm^3; *T. troglodytes*: 1 = 6.3 mm, V = 21.6 mm^3).

Rjabow (1965) analyzed the stomach contents of 89 wheatears (58 adults and 31 juveniles) in May to July in the steppe of northern Kazakhstan. The dominant and most frequent components included Coleoptera (F = 77.5 %) and Hymenoptera (F = 47.2 %), mainly Formicidae, and Orthoptera (32.6 %). Of the Coleoptera, he mainly found representatives of the families Curculionidae, Carabidae and Tenebrionidae. It should be noted on the high percentage of Coleoptera and the low one of Lepidoptera in Rjabow's (l.c.) observations that the method of stomach content analysis overestimates heavily sclerotized invertebrate groups. We have arrived at similar conclusions as Rjabow (l.c.) that the diet of the wheatear mainly consists of invertebrates inhabiting the soil surface and the herb stratum.

Review of taxa contained in the diet of wheatears (*Oenanthe oenanthe*); numbe indicate - absolute f/n:

Annelida: *Lumbricus* sp. 1/1.
Gastropoda: *Cochlicopa lugubris* 1/1.
Araneidea: *Xysticus* sp. 3/3, *Philodromus* sp. 1/1, *Araneus* sp. 4/5, Salticidae 1/1, Lycosidae 2/2.
Diplopoda: *Chromatoiulus unilineatus* 2/2.
Orthoptera: *Isophya pyrenaea* 11/17, *Tettigonia viridissima* 2/2, *Chorthippus* sp. 5/8, *Tetrix* sp 1/1.
Auchenorrhyncha: *Cercopis sanquinolenta* 1/2, Cicadellidae 1/2
Sternorrhyncha: Aphidoidea 2/4
Mecoptera: *Panorpa communis* 1/1
Coleoptera: *Pterostichus metallicus* 2/2, *Pterostichus* sp. 1/1, *Amara* sp 1/1, *Silpha* sp 5/5, *Staphylinus fosso* 2/2, *Staphylinus* sp. 1/1, *Cantharis nigricans* 6/9, *C. rustica* 1/1, *C.obscura* 1/1, *Prosternon tesselatum* 5/5 *Selatosomus aeneus* 2/3, Elateridae - larvae 2/2, *Phyllopertha horticola* 1/1, *Aphodius* sp. 2/2., *Cryptocephalus sericeus* 4/4, Chrysomelidae - larvae 1/3, *Phyllobius* sp. 3/4, *Otiorrhynchus* sp. 4/5
Hymenoptera: Pamphiliidae - larvae 1/1, *Tenthredinidae* 1/1, *Rhogogaster viridis* 1/1, Tenthredinidae - larva 1/1, Ichneumonidae 1/1, *Tetramorium* sp. 3/8, *Formica* sp. 1/1, *Lasius* sp 3/5, Formicidae - pupae 2/6, *Apis mellifera* 5/6, Apidae 1/1
Lepidoptera: *Zygaena* sp. 2/2, Nymphalidae - larvae *Mellicta athalia* 9/10, *Argynnis paphya* 2/2, *Vanessa atalanta* 2/2, *Aglais urticae* 5/5, *Inachys io* 4/4, Satyridae - adults *Erebia medusa* 7/7, Geometridae larvae *Rodostrophia vibicana* 1/1, *Gnophos* sp 5/7, *Colotois pennaria* 1/1, *Epirrita autumnata* 1/1, Geometridae larvae g.sp. 2/2, Lasiocampidae - adults *Macrothylacia rubi* 1/1, Saturniidae - larvae *Saturnia pavonia* 1/1 Arctiidae-larvae: *Eilema complana* 2/2, Noctuidae - larvae. *Apamea* sp 1/1, *Cerapteryx graminis* 5/6 *Mithymna* sp. 2/2, *Caradrina* sp 2/2, Noctuidae - larvae g.sp 3/3, Noctuidae - adults g.sp 1/1, Lycaenidae larvae g.sp. 3/3.
Diptera: Tipulidae - larvae 1/1, Tipulidae - adults 2/2, Bibionidae 3/4, Syrphidae - larvae 1/1, *Lucilia* sp. 1/1 Empididae 3/3, *Tachyna ferox* 2/2, Tachynidae g.sp. 1/1, *Sarcophaga* sp 1/1, Diptera - larvae g.sp 6/10.

Tab 1. Analysis of dietary components of wheatear (*Oenanthe oenanthe*) nestlings in the study environments (n% - relative abundance, V% - relative volume, f% - relative frequency, I - importance index ex Krištín, 1988)

Dietary components	n%	V%	f%	I
Lepidoptera	28.5	62.7	67.7	52.3
Coleoptera	22.1	11.5	44.6	26.0
Orthoptera	11.9	14.5	35.4	20.6
Hymenoptera	13.6	5.2	23.1	14.0
Diptera	11.1	3.2	16.9	10.4
Araneidea	5.1	1.4	13.8	6.8
Sternorrhyncha	3.8	0.2	6.1	3.4
Auchenorrhyncha	1.7	0.3	3.1	1.7
Diplopoda	0.8	0.2	3.1	1.1
Annelida	0.4	0.6	1.5	0.8
Gastropoda	0.4	0.02	1.5	0.6
Mecoptera	0.4	0.1	1.5	0.6

Foraging Territory

During the period in which they fed their young, the wheatears foraged up to the distance of 100-150 m from their nest, often in its immediate vicinity, using the low stone wall containing the nest as a vantage point. The size of the foraging territory varied from 3 to 5 hectares. Hence, with the breeding density of 7 pairs per 100 hestares the foraging territories did not even touch in most cases and thus no intraspecific competition occurred.

On the other hand, we observed interaction with other bird species breeding in our study locality. The wheatears showed dominant behavior against yellowhammers (*Emberiza citrinella*),chasing them away from the vicinity of their own young. On the other hand, a shrike (*Lanius collurio*), nesting 15 meters from one of the wheatear nests observation, several times chased away the wheatear from its nest.

Wartman (1985) found a still greater extent of the foraging territory (averaging 8.5 hectares), which may have been caused by lower availability of food due to the high elevation (up to 2100 m above sea-level) of his study area. He also rarely observed territorial conflicts between wheatears. Aggressive behavior of wheatears towards rock pipits (*Anthus spinoletta*) and hedge sparrows (*Prunella modularis*) was more frequently observed.

Frequency of Feeding Young

We studied the frequency of feeding the young in two nests containing 5 nestlings each. In the first one the nestlings were approximately 7 days old. In the other case the young were approximately two weeks old, i.e. shortly after having left their nest but staying in its close vicinity.

In the first case the parent birds fed their young 11 times an hour; of that, the male fed 7 times and the female only 4 times.

In the other case the parents fed 19 times an hour; of that, the male fed 11 times and the female 8 times.

Hence, the feeding frequency increases with increasing age of the young, and the male brings food more frequently than the female. The difference in feeding frequency between the parent birds in greater in the case of younger nestlings, the female spending more time warming the nest, especially in unfavourable weathear.

Similar results were also obtained by Moreno (1987) in Sweden. Wartmann (1985) also observed a similar feeding frequency (11-15 times an hour).

Foraging Behaviour

The ways of obtaining food, observed in the wheatear (Fig. 4), correspond, in their diversity, with the rather wide range of prey of the wheatear ascertained in our study locality. All variants of the foraging behaviour start in the bird's waiting perched in a vantage point (a shrub, a rock, a heap of stones, a wall). The hight of such vantage points mostly does not exceed 1 m. Having sighted suitable prey, the bird rapidly attacks the insect either sitting on vegetation or on the ground. This was the most frequent way of obtaining prey. Besides, wheatears also hunt insects on wing (especially butterflies and moths) in fluttering flight directly in the air. Often their fluttering close to the ground is observed, the birds then attacking insects on the ground or on vegetation. Less frequently, they were observed pursuing their prey, running on the ground or raking and pecking in it. The foraging birds combine these strategies in various ways and often return to their vantage points. The ratio of the different foraging strategies depends, to a considerable degree, on the supply of suitable prey, and thus it may differ not only in different habitat types but even in one and the same locality within one breeding season.

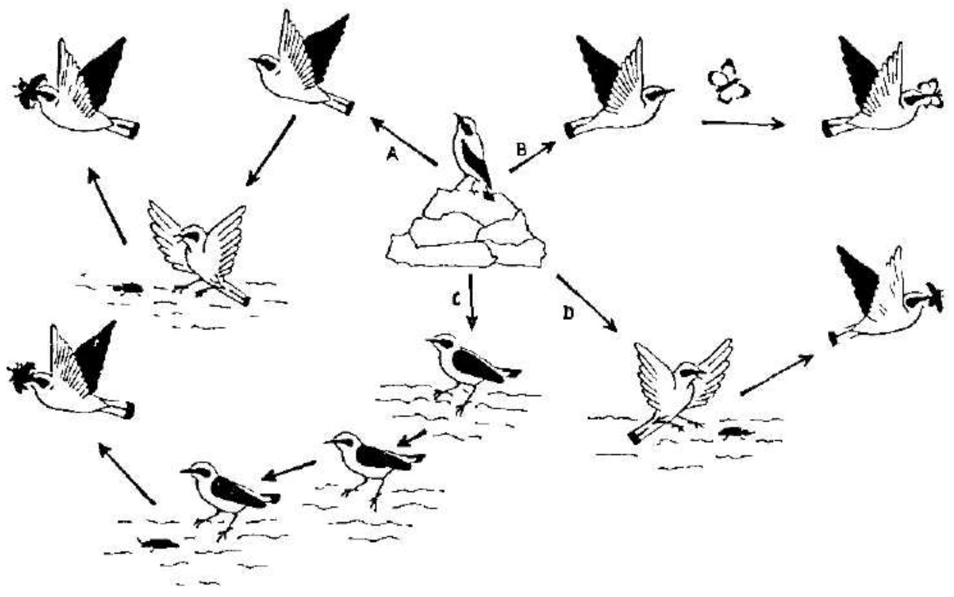

Fig. 1. Foraging strategies of wheatears (*Oenanthe oenanthe*). A - fluttering flight and then attacking insects on the ground or on vegetation, B - catching insects in fluttering flight in the air, C - chasing and catching insects on the ground; D - perching on vantage point and then attacking insects on the ground or on vegetation

The above is corroborated by the results obtained by other authors. Wartmann (1985) observed, first of all, wheatears waiting for their prey in vantage points and, besides, pursuing flying insects up to distances of 30 meters. Moreno (1984) also recorded waiting in vantage points as the most frequent foraging technique, the wheatears preferring low objects (up to 20 m high) as vantage points. This technique was combined with gathering food on the ground. Catching prey in the air occurred rarely. On the other hand, Kneis & Lauch (1987), having observed wheatears at Hiddensee, recorded walking on the ground and pecking or raking as the most frequent foraging strategies and waiting on vantage points in only 16 % of cases.

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ÜBER DIE PUPPEN DER MITTELEUROPÄISCHEN TORTRICINI (LEPIDOPETERA, TORTRICIDAE)

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Abstract. The pupae of accessible Central European Tortricini (Lepidoptera, Tortricidae) are characterized, described and pictured on base of their pupae and a key for determining the genera and species as well as some biological data are added. The present system of this group is discussed from the point of view of pupal characters.

Diese Arbeit knüpft an die von Patočka (1980 a, 1982, 1983) an und behandelt eine weitere Tribus der Tortricidae, die Tortricini. In der dem Verfasser zugänglichen Literatur wird diese Gruppe hinsichtlich deren Puppen nicht zusammenfassed bearbeitet. Die Puppen der einzeln Arten werden in mehreren Arbeiten, z.B. bei Evenhuis et al. (1973), Patočka et al. (1960), Patočka (1980) und Speyer (1958) charakterisiert. Unausreichende Beschreibungen findet man in manchen Handbüchern wie Bradley et al. (1973). Da diese Gruppe zu den wirtschaftlich wichtigsten gehört, ist die Möglichkeit der Bestimmung bereits im Puppenstadium für mehrere Fachgebiete bedeutungsvoll. Es werden hier 22 Arten von 4 Gattungen bearbeitet. Der Verfasser dankt für die Ermöglichung eines Studiums der Puppensammlung der Zoologischen Staatssammlung in München der Alexander von Humboldt-Stiftung, die ihm ein Studiumstipendium erteilt hat und der Leitung der Staatssammlung verbindlichst. Für die Übergabe des Puppenmaterials is er ebenfalls den Herren Bengtsson (Löttorp, Schweden), Buszko (Toruň, Polen), Gregor (Brünn), Karlsholt (Kopenhagen) und J. Kulfan (Zvolen) zum Dank verpflichtet. Das System und die Nomenklatur folgt Leraut (1980) und Schnack et al (1985), die puppenmorphologische Terminologie Mosher (1916). Die bionomischen Angaben werden auf Grund von Bradley et al. (1973), Schütze (1931) und nach eigenen Beobachtung erwähnt. Material und Methodik, ferner die wichstigsten Merkmale und ihre Variabilität entsprechen den Angaben in Patočka (1983).

Tribus Tortricini Obraztsov, 1949

Körperbau ist von den Abb. 1-2 zu ersehen. Maxillae grenzen relativ lang an die Vorderbeine, diese von den Antennae durch die Mittelbeine deutlich isoliert (Abb. 1, 22).

1. Abdominalsegment ohne-, 2. nur mit einer Kaudalreihe von Dornen, die oft schwächer und stumpfer als die auf den folgenden Segmenten sind. 3.-7. und meistens auch das 8. Segment mit je einer Basal- un einer Kaudalreihe von Dornen, am 9. Segment gibt es nur eine Basalreihe und am 10. fehlen die Dornen immer. Kremaster stets entwickelt, kurz bis mittellang, stark dorsoventral komprimiert und charakteristisch schräg ventrokaudal orientiert. Meistens trägt er ein Paar spitze kaudolaterale Ausläufer. Mit 2 Paaren von Perianalen- und 4 Paaren von Endborsten, diese nicht selten hakenartig. D_2 und L_1 entsprigen von der Ventralseite des Kremasters weit voneinnander, D_2 meist schrag frontoventral von L_1, Sd_1 entspringen von der lateralen, D_1 von der dorsalen Seite des Kremasters, alle von dessen Enddrittel (Abb. 6-8, 107-109).

Von der Tribus Archipini und Olethreutini durch die Form und Orientation des Kremasters, von Cochylini, Cnephasiini, Eucosmini und Grapholithini ausserdem durch die Abwessenheit der Dornen am 10. Abdominalsegment leicht zu unterscheiden.

Die Mehrzahl der Arten ist dendrophil, die an Kräutern lebenden bevorzugen meistens die Vertreter der Familien Rosaceae und Ericaceae, seltener Lythraceae u.a. Mehrere Arten sind ± stenophag. Die Raupen leben zwischen versponnenen Blättern, ausnahmsweise endophag in Früchten, Verpuppung meist am Frassort. Für diese Gruppe ist die Überwinterung als Imago mit der Eiablage erst im Frühling charakteristisch. Andere Arten überwintern als Ei, selten als Raupe. Biotope der meisten Arten sind Waldbestände, insbesondere ihre Randzone, Waldsteppe, Uferbestände, andere leben in freiem Gelände, an Heiden und Mooren. Mehrere sind Schädlinge der Wald- und Obsthölzer oder Kulturpflanzen.

Bestimmungstabelle der Gattungen

Unberücksichtigt bleibt die Gattung *Spatalistis* Meyrick, 1907, von welcher kein Material vorlag

1 Proboscis kürzer als die doppelte Länge von Labium + Palpi labiales (Abb. 1, 13) Vorder- und Mittelhüften grenzen etwa gleichlang aneinander (Abb. 1, 4, 14) 3

- Proboscis wenigstens doppelt so lang wie Labium + Palpi labiales (Abb. 21) Vorderhüften grenzen viel kürzer aneinander als die Mittelhüften (Abb. 33, 43, 72) 2

2 (1) Kremaster mit starken, spitzen kaudolateralen Ausläufern (Abb 54-56) .... *Acleris*

- Kremaster kaudolateral abgerundet, ohne spitze Ausläufer (Abb. 24, 29) .... *Croesia*

3 (1) Frons mit einem Längskiel (Abb. 1, 3) Metanotum stark gerunzelt (Abb. 9) .... *Tortrix*

- Frons ohne einen Längskiel (Abb. 13). Metanotum kaum gerunzelt (Abb. 12) .... *Aleimma*

Gattung TORTRIX Linnaeus, 1758

Puppen relativ gross, Skulptur am Abdomen papillos-zellenartig. Frons mit einem Längskiel (Abb. 13). Maxillae (Proboscis) kürzer als doppelte Länge des Labiums mit den Palpi (Abb. 1). Vorderhüften grenzen aneinander fast so lang wie die Mittelhüften, diese grenzen an die Vorderbeine wenigstens 2x länger als an die Mittelbeine (Abb. 4.). Dornen der Basal- und Kaudalreihe an mittleren Abdominalsegmenten fast gleichgross, relativ klein, dicht, steil kammartig von erhabenen Querleisten entspringend (Abb. 7). Ventral reichen die Dornen der Basalreihe bis zu den lateralen Bortsten, was auch am 9. Segment der Fall ist (Abb. 9). Spuren der Bauchbeine relativ deutlich (Abb. 1). Kremaster kurz und breit, kaudolaterale Ausläufer breit (Abb. 6-8).

An Eichen gebunden, das Ei überwintert, Verpuppung unter einem umgeschlagenen Blattrand oder zwischen versponnenen Blättern. Nur eine mitteleuropäische Art.

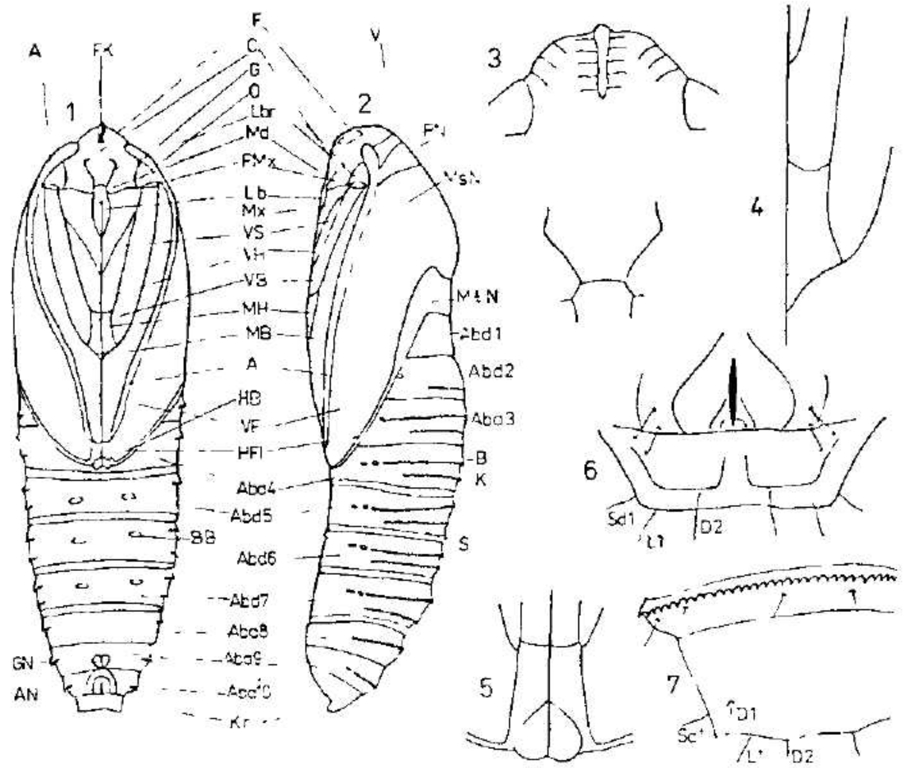

Abb. 1-7 *Tortrix viridana*: 1 - Habitusbild in Ventral-, 2 - in Lateralsicht, 3 - Frons, Labrum, 4 - Mittelhufte und Umgebung, 5 - Endteil der Mittel- und Hinterbeine, Antennae und Flugel, 6 - Abdominalende in Ventral-, 7 - in Dorsalsicht. A - Antennae, Abd1-10 - 1-10 Abdominalsegment, AN - Analnaht, B - Basalreihe der Dornen, BB - Bauchbeine, Cl - Clypeus, F - Frons, FK - Frontalkamm, G - Genae, GN - Genitalnaht (Mannchen), HB - Hinterbeine, HFl - Hinterflugel, K - Kaudalreihe der Dornen, Kr - Kremaster, Lb - Labium, Lbr - Labrum, MB - Mittelbeine, MH - Hittelhuften, MsN - Mesonotum, MtN - Metanotum, Mx - Maxillae (+ Proboscis), O - Oculi, PMx - Palpi maxillares, PN - pronotum, S - Spiraculum, V - Vertex, VB - Vorderbeine, VFl - Vorderflugel, VH - Vorderhuften, VS - Vorderschenkel. D1, D2, L1, Sd1 - Bezeichnung der Borsten.

Tortrix viridana Linnaeus, 1758

Puppe 7,5-10,5 x 2-3 mm (5 ♂, 5 ♀ aus der Slowakei), ♀ grösser als ♂. Färbung pechbraun bis rötlich braunschwarz, Exuvie rötlich dunkel-bis schwarzbraun, glättere Stellen ziemlich glänzend. Kopf und Thorax ± quergerunzelt. Vorderflügel mit angedeuteter Nervatur. Skulptur am Kaudalteil der beweglichen Abdominalsegmente wesentlich gröber als am Frontal- und Mittelteil, Borsten relativ gross. Frons vor die Basen der Antennae stark, stumpf hervortretend mit einem Längskamm (Abb. 3). Clypeus vom Labrum kaum abgetrennt, Postclypeus + Labrum bilden ein fünfeckiges Gebilde. Maxillae grenzen aneinander deutlich kürzer als die Länge des Labiums + Palpi labiales (Abb. 1), Vorderhüften grenzen aneinander etwa so lang wie die Mittelhüften (Abb. 1), diese an die Vorderbeine fast 2 x länger als an die Mittelbeine (Abb. 4)

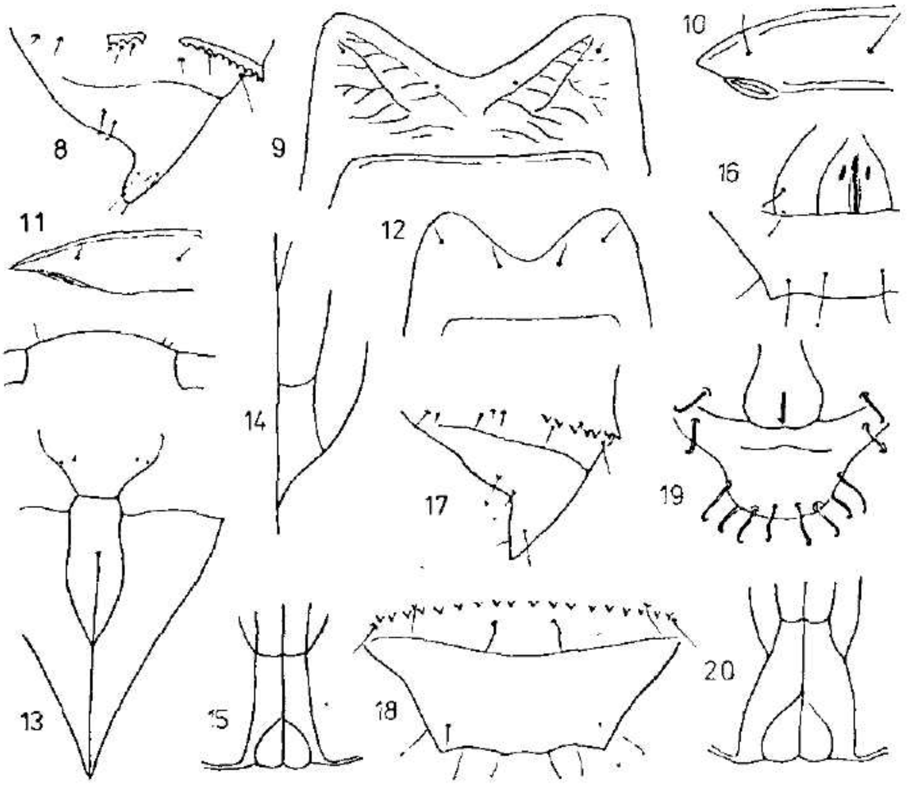

Abb. 8-10. *Tortrix viridana*, 11-18 *Aleimma loeflingiana*, 19-20 *Croesia forskaleana*: 8, 17 - Abdominalende, Lateralsicht, 9, 12 - Metanotum, 10, 11 - Pronotum (linke Hälfte), 13 - Frons, Clypeus, Labrum, Labium, Maxillae (Proboscis), 14 - Mittelhüfte und Umgebung, 15, 20 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 16, 19 - Abdominalende, Ventral-, 18 - Dorsalsicht.

Antennae höchstens wenig länger als die Mittelbeine (Abb. 5). Pronotum relativ lang, lateral kaudalwärts deutlich ausgebuchtet. Thorakal-Spiraculum gross, spaltenförmig (Abb. 10). Metanotum kurz, breit, etwa zu 1/2 sehr breit ausgeschnitten, frontolaterale Ausläufer abgerundet oder abgeschieft (Abb. 9). Am 2. Abdominalsegment die Kaudalreihe mit rd. 30 stumpfen Dörnchen, am 3. Segment rd. 14 Dörnchen der Basal- und 30 denen der Kaudal-, am 4.-7. Segment 8-10 Dörnchen der Basal- und 18-20 denen der Kaudalreihe zwischen den Dorsalborsten. 8. und 9. Segment mit nur einer Reihe, Dörnchen so gross, wie an den vorgehenden, klein und dicht. Kremaster kurz, mit schwachen kaudolateralen Ausläufern, mässig gerunzelt, Borsten deutlich (Abb. 6-8).

Raupe an Eichen, bevorzugt *Quercus robur* und *Q. pubescens*. Vor allem in Aue- und Niederungswäldern, aber auch in der Waldsteppe, wo diese Art zu starken Gradationen neigt und ein gefährlicher Forstschädling ist.

Gattung ALEIMMA Hübner, 1825

Puppen relativ kleiner, feiner skulpturiert, am Abdomen mit Mikrozapfen, Kaudalteil der beweglichen Segmente mit Zell-/Papillen-/Skulptur. Stirn wenig vor die Wurzel der Antennen vorgewölbt, ohne Längskiel. Proboscis kürzer als die doppelte Länge des Labiums + Palpi (Abb. 13). Vorderhüften grenzen kaum oder wenig länger aneinander als die Mittelhüften (Abb. 14). Metanotum kurz, breit, kaum gerunzelt (Abb. 12). Nahe der Basis der basalen und mittleren Abdominalsegmente gibt es eingesunkene Querbänder. Die Dornen entspringen von kleinen Querleisten, die der Basalreihen dünner, jedoch wenig grösser als die der Kaudalreihen. Lateral reichen die Basalreihen nur etwa zum Niveau der Spiracula. Kremaster kurz mit kleinen kaudolateralen Ausläufern (Abb. 16-18).

An Eichen gebunden. Überwinterung als Ei. Verpuppung zwischen Blättern, aber auch in der Waldstreu. In Mitteleuropa nur eine Art.

Aleimma loeflingiana (Linnaeus, 1758)

Puppe 7-9 x 2.2-2.5 mm (5 ♂, 5♀ aus der Slowakei), rötlich braun, Exuvie hellbraun. Skulptur am Kopf und Thorax vorwiegend fein, wenig gerunzelt. Vorderflügel mit angedeuteten Adern. Borsten deutlich. Suturae der Mundteile stark, dunkelbraun. Mittelhüften grenzen an die Vorderbeine wenig, höchstens um 1/3 länger als an die Mittelbeine (Abb. 15). Pronotum kürzer, kaudal weniger ausgebuchtet als bei *T. viridana* (Abb. 11). Metanotum ziemlich kurz, frontolaterale Ausläufer breit abgerundet (Abb. 12). Am 2. Abdominalsegment rd. 14 Dörnchen der Kaudal-, am 3.-6. Segment 5-6 denen der Basal- und 12-14 der Kaudalreihe zwischen den Dorsalborsten. Am 7.-8. Segment sind die Dörnchen der Kaudalreihe relativ kleiner, am 9. Segment gibt es 15 – 18 relativ kleine

Dornen nur in einer Reihe. Kremaster mittelkurz, im Medianteil manchmal etwas lappig. Häkchen deutlich (Abb. 16-18).

Raupe an Eichen, mit Vorliebe an *Quercus petraea*-Gruppe sowie an *Q. pubescens*. Mehr in der Waldsteppe und in frischen Eichenwäldern im Hügelland verbreitet, dort zuweilen auch schädlich.

Gattung CROESIA Hübner, 1985

Skulptur am Kopf und Thorax relativ fein, am Abdomen ähnlich wie bei *Aleimma*. Borsten deutlich. Stirn zwischen den Wurzeln der Antennae nur mässig oder kaum erhaben, ohne Längskiel (Abb. 23, 34). Maxillae (Proboscis) wenigstens 2x länger als

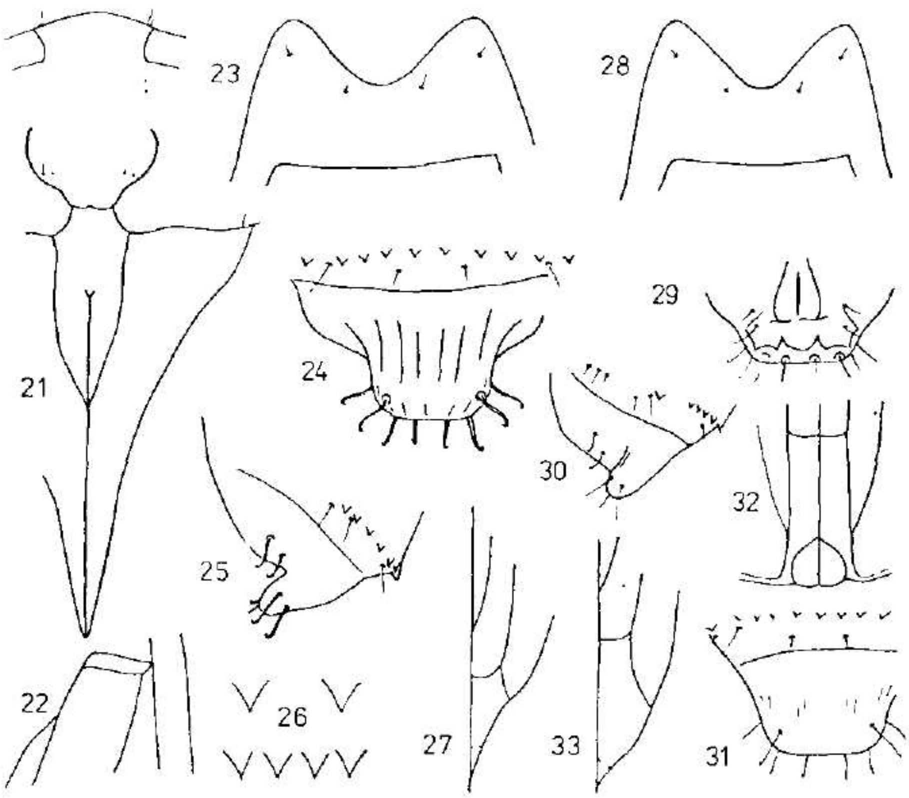

Abb. 21-27. *Croesia forskaleana*, 28-33 *C. holmiana*: 21 - Frons, Clypeus, Labrum, Labium, Maxillae (Proboscis), 22 - Palpi maxillares und Umgebung, 23, 28 - Metanotum, 24, 31 - Abdominalende, Dorsal-, 25, 30 - Lateralsicht, 26 - Dornen der Basal- und Kaudalreihe am 5. Abdominalsegment, 27, 33 - Mittelhüfte und Umgebung, 29 - Abdominalende in Ventralsicht, 32 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel.

Labium + Palpi (Abb. 23). Mittelhüften grenzen wenigstens 2x länger aneinander als die Vorderhüften (Abb. 27, 33, 36). Dornen der Basalreihen reichen lateral nur in die Nähe der Spiracula, sind relativ nur wenig grösser als die der Kaudalreihen (Abb. 26). Kremaster uneinheitlich gebaut: entweder kurz, breit, kuadolateral abgerundet, ohne Ausläufer (Abb. 24, 31), oder aber relativ lang, tief gespalten mit sehr langen kaudolateralen Spitzen (Abb. 40).

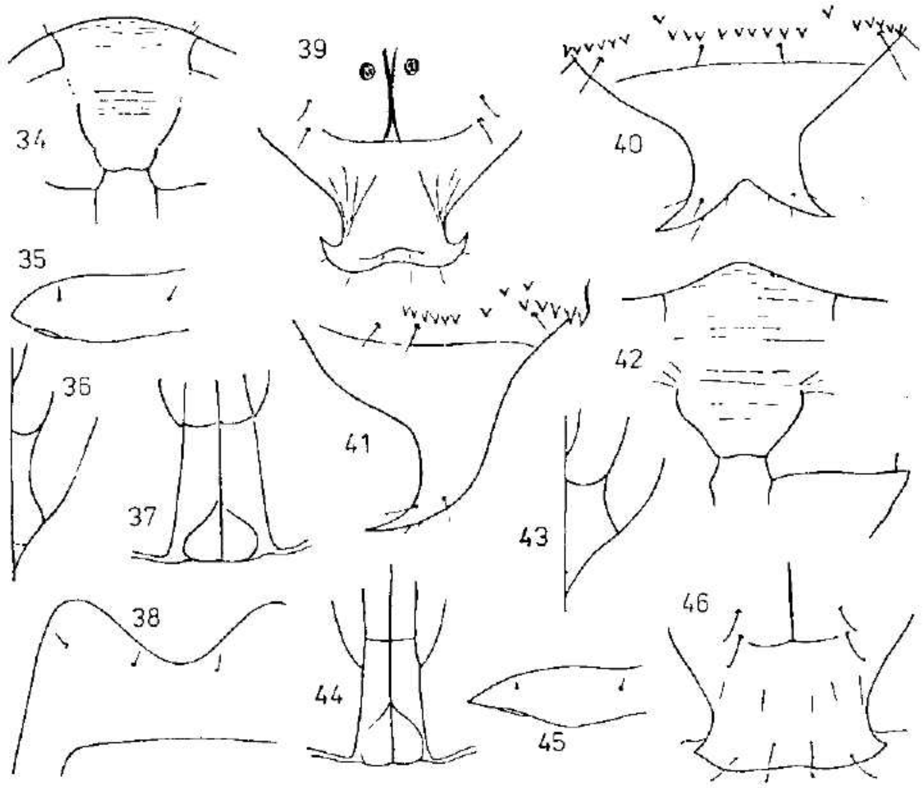

Abb. 34-41. *Croesia bergmanniana*, 42-46 *Acleris comariana*: 34, 42 - Frons, Clypeus, Labrum, 35, 45 - - Pronotum (linke Hälfte), 36, 43 - Mittelhüfte und Umgebung, 37, 44 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 38 - Metanotum, 39, 46 - Abdominalende in Ventral-, 40 - in Dorsal-, 41- in Lateralansicht.

Raupen dendrophil, verpuppen sich in ihren Gespinsten zwischen Blättern. Überwinterung als Ei oder junge Raupe. Biotope meist die Waldsteppe, das Gebüsch, die Waldränder und sekundär die Gärten. In Mitteleuropa 3 Arten, die manchmal auch zu der nachfolgenden Gattung *Acleris* gereiht werden.

Bestimmungstabelle der Arten

1 Kremaster mit kräftigen kaudolateralen Zähnen, dazwischen tief ausgeschnitten (Abb. 39-41). Mittelhüften grenzen viel länger an die Vorder- als an die Mittelbeine (Abb. 36) .... *C. bergmanniana*

- Kremaster ohne kaudolaterale Zähne, am Ende abgerundet (Abb. 24, 25, 30, 31). Mittelhüften grenzen nicht oder kaum länger an die Vorder- als an die Mittelbeine (Abb. 27, 33) 2

Mittelhüften grenzen an die Vorder- und Mittelbeine beiläufig gleichlang (Abb. 33). Häkchen am Kremaster ziemlich schwach (Abb. 29) .... *C. holmiana*

- Mittelhüften grenzen an die Vorderbeine viel kürzer als an die Mittelbeine (Abb. 27). Häkchen am Kremaster recht stark (Abb. 19) .... *C. forskaleana*

Croesia forskaleana (Linnaeus, 1758)

Puppe 6,5-8,5 x 1,8-2,2 mm (3 ♂, 3 ♀ aus der Slowakei), bräunlich gelb, Exuvie bleich bräunlich gelbweiss, seidenglänzend. Stirn zwischen den Antennae mässig, haufenartig erhaben (Abb. 23). Suturae am Kopf und Thorax wenig kontrastreich. Grenze des Postclypeus + Labrum an die Genae gewölbt, an das Labium ± konkav. Mittelhüften grenzen an die Vorderbeine viel kürzer als an die Mittelbeine (Abb. 27). Antennae meist etwas länger als die Mittelbeine (Abb. 20). Pronotum kaudolateral mässig gewölbt. Metanotum relativ kurz, frontal breit abgerundet ausgeschnitten, frontolaterale Ausläufer ebenfalls abgerundet (Abb. 23). Am 2.-7. Abdominalsegment gibt es 18-20 Dornen der Kaudal-, am 3.-7. Segment 5-7 denen der Basalreihe zwischen den Dorsalborsten. Am 8. Segment sind die Dornen der Basal- und Kaudalreihe fast gleichgross, am 9. Segment gibt es 9-12 relativ kleine, dünne Dornen. Dornen relativ schwach sklerotisiert. Kremaster mittelkurz, abgerundet, massig gerunzelt, die Häkchen relativ recht stark (Abb. 19, 24, 25).

Raupe an *Acer*, meist klein überwinternd. Ausnahmsweise ein Schädling.

Croesia holmiana (Linnaeus, 1758)

Puppe 7-8 x 2-2,4 (2 ♂, 2 ♀ aus der Slowakei), gelbbraun, Exuvie braungelb, Frons mässig gewölbt erhaben, Suturae am Kopf relativ deutlich. Mittelhüften grenzen an die Vorder- und Mittelbeine etwa gleichlang (Abb. 33). Antennae meist deutlich länger als die Mittelbeine (Abb. 32), ragen bis zum Niveau der sichtbaren Enden der Hinterbeine. Frontolaterale Ausläufer des Metanotums ein bisschen spitzer als bei *C. forskaleana* (Abb. 28). Kaudalreihe der Segmente 2-6 mit 20-25-, Basalreihe der 3.-7. mit 4-6 Dornen zwischen den Dosalborsten. Die Dornen sind ziemlich gleichgross, nur am 7.-8. Segment die der Kaudalreihe deutlich kleiner. Kremaster kurz, im Endteil an der Ventralseite mit Leistenskulptur, kaudolateral abgerundet. Häkchen viel kleiner als bei *C. forskaleana*.

Raupe an *Malus*, *Pyrus*, *Prunus*, *Crataegus*, *Rosa* u. a., Überwinterung meistens als E an Obstbäumen zuweilen mässig schädlich.

Croesia bergmanniana (Linnaeus, 1758)

Puppe 7-9- x 2-2,6 mm (5 ♂, 5 ♀ aus der Slowakei), rotbraun, Einschnitte und Suturae dunkler, Exuvie heller. Frons oben flach abgerundet, Clypeus etwas gerunzelt (Abb. 34). Mittelhüften grenzen wenigstens 2 x länger an die Vorder- als an die Mittelbeine (Abb. 36). Antennae meist kaum, oder wenig länger als die Mittelbeine (Abb. 37). Metanotum etwas breiter als bei den vorigen, sonst ähnlich (Abb. 38). Kaudalreihe am 2. Abdominalsegment mit nur 9-10, am 3.-7. mit 16-18 Dornen zwischen den Dorsalborsten. Dornen der Basal- wenig kleiner als die der Kaudalreihe. Diese am 3.-8. Segment kaudalwärts grösser, zwischen den Dorsalborsten gibt es 5-6 Dornen. 9. Segment mit rd. 20 kleineren Dornen. Kremaster von den vorgehenden stark abweichend, relativ lang mit sehr grossen kaudolateralen Spitzen, dazwischen tief ausgeschnitten. Ventralseite lateral stark gerunzelt (Abb. 39-41).

Raupe an *Rosa*, Überwinterung meist als Ei, an Gartenrosen zuweilen schädlich.

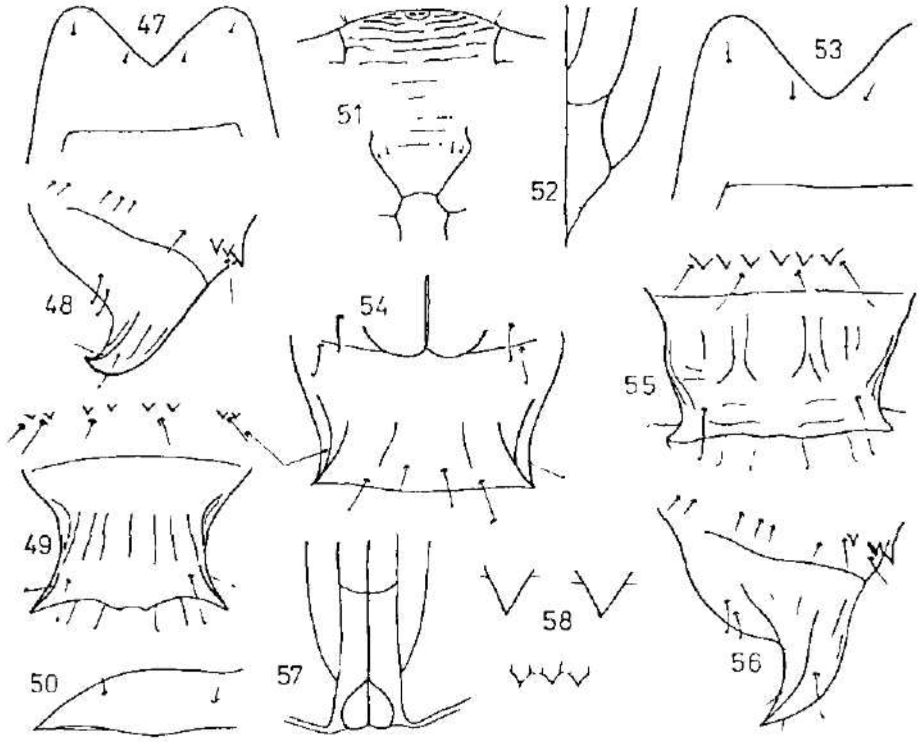

Abb. 47-49. *Acleris comariana*, 50-58 *A. sparsana*: 47, 53 - Metanotum, 48, 56 - Abdominalende in Lateral-, 49, 55- in Dorsalsicht, 50 - Pronotum (linke Hälfte), 51 - Frons, Clypeus, Labrum, 52 - Mittelhüfte und Umgebung, 54 - Abdominalende in Ventralsicht, 57 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 58 - Dornen der Basal- und Kaudalreihe am 5. Abdominalsegment.

Gattung ACLERIS Hübner, 1825

Skulptur meist mittelfein bis mittelgrob, Abdomen mit Mikrozapfen, bewegliche Segmente hinten mit vergrösserter Zellskulptur. Adern an Vorderflügeln deutlich angedeutet. Frons zwischen den Antennae fast flach (Abb. 51), oder ± gewölbt (Abb 97, 108), manchmal aber mit grossen Auswüchsen (Abb 136, 141). Proboscis wenigstens 2 x länger als Labium mit Palpi (Abb. 23). Mittelhüften grenzen wenigstens 2 x länger aneinander als die Vorderhüften (Abb. 43, 65, 85). Dornen der Basalreihen oft deutlich grösser als die der Kaudalreihen. Thorakale Spiracula spaltenformig, unauffällig, abdominale oval, erhaben. Kremaster mit deutlichen spitzen, meist mittelgrossen kaudolateralen Zähnen, dazwischen nicht oder nur seicht ausgeschnitten (Abb. 64, 99, 118).

Raupen meist an Laub-, seltener an Nadelholzern oder Kräutern, verpuppen sich in ihren Gespinst zwischen Blättern. Es überwintert die Imago, seltener das Ei. Die meisten Arten leben in der Randzone der Laubwälder, der Waldsteppe oder Gebusch, aber auch an Mooren, Heiden usw. Einige sind gelegentliche Schädlinge der Bäume oder Kulturpflanzen. Von den mehr als 30 mitteleuropaischen Arten standen 17 zur Verfugung

Bestimmungstabelle der Arten

1 Frons mit einem grossen Vorsprung (Abb. 139, 144). 2

- Frons ohne einen grossen Vorsprung, hochstens nur mit einer niedrigen Erhabenheit (Abb. 105, 111). 3

2(1) Stirnvorsprung einfach Clypeus und Basis der Antennae ohne Hocker (Abb 139) ...... *A. literana*

- *Stirnvorsprung dreiteilig. Auch am Clypeus und Basis der Antennae gibt es Hocker (Abb. 144)* .... *A. fimbriana*

3(1) Mittelhuften grenzen viel (2 x oder mehr) langer an die Vorder- als an die Mittelbeine (Abb. 116, 126) 4

- Mittelhuften grenzen kaum- oder wenig langer an die Vorder- als an die Mittelbeine (Abb. 43, 52) 11

4(3) Antennae uberragen die Mittelbeine nicht oder kaum (Abb 15, 90) 5

- Antennae überragen die Mittelbeine deutlich, wenigstens um ihre Breite, oft aber wesentlich mehr (Abb 32, 61) 6

5(4) Am 5 Abdominalsegment die Dornen der Basalreihe und Kaudalreihe fast gleichgross (Abb 26) Kremaster mit sehr grossen kaudodorsalen Spitzen, dazwischen tief ausgeschnitten, gabelartig (Abb 40) .... *Croesia bergmanniana*

- Am 5. Abdominalsegment die Dornen der Basal- viel grosser als die der Kaudalreihe (Abb 58) Kremaster mit mittelgrossen kaudodorsalen Auslaufern, dazwischen nicht oder schwach ausgeschnitten (Abb. 90,130) 6

6(5) Mittelhüften grenzen an die Vorderbeine etwa 3 x länger als an die Mittelbeine (Abb 88) *A shepherdana*

- Mittelhuften grenzen an die Vorderbeine nur etwa 2 x langer als an die Mittelbeine (Abb 126) .... *A. abietana*

7(4) Frons relativ stark vor die Wurzel der Antennae gewolbt (Abb 123) 4-6. Abdominalsegment Dornen der Basal- wenig grosser als die der Kaudalreihe (Abb. 77) .... *A. asperana*

- *Frons zwischen den Antennae schwach oder nicht gewolbt (Abb 51, 74) Am 4.-6 Abdominalsegment* die Dornen der Basal- viel grosser als die der Kaudalreihe (Abb. 58) 8

8(7) Metanotum relativ lang (Abb 130) Kremaster an der Dorsalseite stark langsgerunzelt (Abb 125) Vorderflugel der Puppe dunkel- bis schwarzbraun 9

- Metanotum relativ kurz (Abb. 47, 60). Kremaster an der Dorsalseite wenig oder nur im Kaudalteil langsgerunzelt (Abb 108). Vorderflugel der Puppe rotbraun 10

9(8) Antennae ragen fast zur Spitze der Vorderflugel (Abb 138). Am 5 Abdominalsegment gibt es 6-7 Dornen der Basalreihe zwischen den Dorsalborsten. .... *A lorquiniana*

- Antenae ragen nur unweit kaudal von den Spitzen der Hinterbeine (Abb. 90) Am 5. Abdominalsegment gibt es 3-4 Dornen der Basalreihe *zwischen den Dorsalborsten*............ *A. hastiana*

10(8) Vorderflügel unter der Spitze deutlich konkav (Abb 61) .... *A. rhombana*

- Vorderflügel unter der Spitze kaum oder nicht konkav (Abb 57) .... *A variegana*

11(3) Am 5. Abdominalsegment liegen 3-4 Dornen der Basalreihe zwischen den Dorsalborsten. Puppe rot- oder dunkelbraun, Exuvie heller rotbraun oder braun............ 12

- Am 5 Abdominalsegment liegen 6-7 Dornen der Basalreihe zwischen den Dorsalborsten. Puppe hell braun, Exuvie bleich weissgelblich-bräunlich .... *A. ferrugana*

12(11) Frons mit einem kleinen Höcker, oder zwischen den Wurzeln der Antennae deutlich etwas bauchig (Abb 100, 111) 13

- Frons zwischen den Wurzeln der Antennae flach abgerundet (Abb 117, 122, 127)............ 15

13(12) Metanotum mit je einer schrägen Leiste (Abb 101, 112 14

- Metanotum ohne erhabene schräge Leisten (Abb 106, 130)............ 15

14(13) Frons stark etwas kegelartig oder sogar knopfartig vorgezogen (Abb 111)............ *A. boscana*

- Frons mässiger und stark abgerundet vorgezogen (Abb. 100) .... *A. logiana*

15(12) Antennae überragen die Mittelbeine kaum oder wenig (Abb. 76). Kremaster dorsal stark längsgerunzelt (Abb 86) .... *A. notana*

- Antennae überragen die Mittelbeine wesentlich und ragen wenigstens zum Niveau der sichtbaren Enden der Hinterbeine (Abb 110, 138). Kremaster oft dorsal schwacher oder kaum gerunzelt (Abb. 137) 16

16(15) Labium mit ruguloser Fläche im Mittelteil Kremaster ausser der kaudolateralen auch mit einem Paar ziemlich starker kaudomedianen Ausläufer (Abb. 135, 137) .... *A emargana*

- Labium ohne rauhe Fläche in der Mitte (Abb 51). Kremaster ohne oder mit schwachen kaudomedianen Ausläufern (Abb. 55, 96) 17

17(16) Frons oben stumpf abgerundet, stark gerunzelt (Abb. 51) Kremaster dorsal mit deutlichen Längsrunzeln (Abb. 55)............ *A sparsana*

- *Frons oben mehr bauchig* (Abb. 42, 94), kaum oder *schwach gerunzelt. Kremaster dorsal meist schwach* oder kaum gerunzelt (Abb 46, 96 18

18(17) Metanotum breit abgerundet ausgeschnitten (Abb. 99). Am 3. Abdominalsegment meist 3-4 Dornen der Basalreihe zwischen der Dorsalborsten, diese viel grösser als die der Kaudalreihe .... *A schalleriana*

- Metanotum fast winkelig ausgeschnitten (Abb. 47). Am 3 Abdominalsegment 6-8 Dornen der Basalreihe zwischen den Dorsalborsten, diese relativ wenig grösser als die der Kaudalreihe .... *A comariana*

Acleris comariana (Lienig & Zeller, 1846)

Puppe 7,3-8 x 2,0-2,5 mm (2 ♂, 1 ♀ aus Polen), rotbraun, flügel gelbbraun, Exuvie heller, Skulptur mittelfein. Frons zwischen den Wurzeln der Antennae stumpf kegelförmig vorgezogen, Clypeus mässig gerunzelt. Mittelhüften grenzen an die Vorder- und Mittelbeine fast gleichlang (Abb. 43). Antennae überragen wenig oder kaum die Mittelbeine (Abb. 44). Vorderflügel unter der Spitze kaum konkav. Pronotum schmal, kaudolateral deutlich ausgebuchtet (Abb. 45). Metanotum relativ kurz, breit, etwa rechtwinklig ausgeschnitten, frontolaterale Ausläufer abgerundet (Abb. 47). Am 2.-7. Abdominalsegment mit etwa 14 Dornen der Kaudal-, am 3.-7. Segment mit 3-4 Dornen der Basalreihe zwischen den Dorsalborsten. Die Dornen der Basalreihe viel grösser und dünner als die der Kaudalreihe (vgl. Abb. 18). 9. Segment mit nur etwa 8 Dornen. Kremaster mit breiten Ausläufern, an der Ventral- und Dorsalseite etwas längsgerunzelt, oft mit 1 Paar kleiner kaudomedianer Lappen oder Zähnchen (Abb. 46, 48, 49).

etwas konkav (Abb. 53). 2. Abdominalsegment mit rd. 16, 3. mit 13-16, 4.-7. mit 9-13 kleinen, relativ dünnen und stumpfen Dornen der Kaudal-, 3.-7. Segment mit 3-4 Dornen der Basalreihe zwischen den Dorsalborsten. Am 8. Segment ist die Kaudalreihe nur dorsal, am 9. nur rd. 6 breite Dornen der Basalreihe, etwa so gross wie am Segment 8. Kremaster an der Dorsalseite stark gerunzelt, Kaudalrand ohne deutlichere Lappen (Abb. 54-56).

Raupe an Laubhölzern, hauptsächlich *Fagus, Carpinus, Acer pseudoplatanus,* Überwinterung als Imago. Laubwälder, vertikal weit verbreitet.

Acleris rhombana (Denis et Schiffermüller, 1775)

Puppe 7-8 x 2,0-2,7 mm (5♂, 5 ♀ aus der Slowakei) relativ gedrungen, rotbraun, Exuvie heller. Frons und Clypeus ziemlich stark gerunzelt. Frons zwischen den Antennae etwas bauchig (Abb. 59). Seiten des Labrums wenig konkav. Mittelhüften grenzen mehr als 2x länger an die Vorder- als an die Mittelbeine (Abb. 65). Antennae überragen die

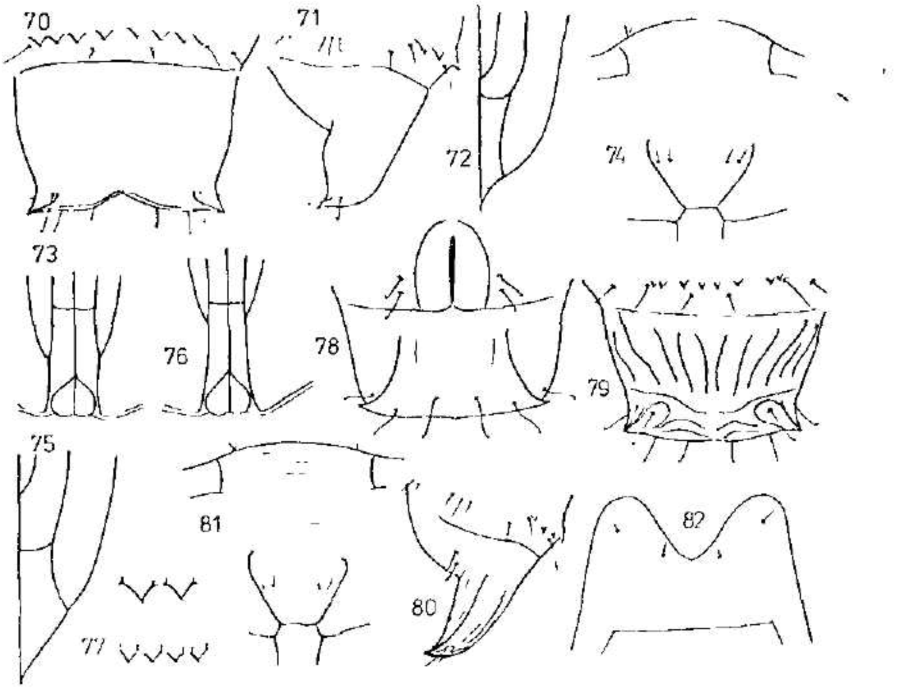

Abb. 70-73. *Acleris aspersana*, 74-80 *A. ferrugana*, 81, 82 *A. notana*: 70, 79 - Abdominalende in Dorsal-, 71 - - in Lateralsicht, 72, 75 - Mittelhüfte und Umgebung, 73, 76 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 77 - Dornen der Basal- und Kaudalreihe am 5 Abdominasegment, 78 - Abdominalende in Ventralsicht, 82 - Metanotum.

Mittelbeine stark und ragen wenigstens zum Niveau der sichtbaren Enden der Hinterbeine. Vorderflügel unter der Spitze charakteristisch konkav (Abb. 61).Pronotum mit mässig gebogener Frontal- und Kaudalseite. Metanotum relativ kurz, Ausschnitt breit (Abb. 60). Dornen am Abdomen gross und steil, die der Kaudalreihe am 2. Segment (rd. 20) ziemlich spitz. Am. 3.-6. Segment gibt es 4 Dornen der Basal- und 12-16 denen der Kaudalreihe, die viel kleiner als die ersteren sind, zwischen den Dorsalborsten. Kremaster mit starken Runzel- und Leistengebilden hauptsächlich lateral und im Kaudalteil, in Ventralsicht mässig konkav, in Dorsalsicht eher konvex (Abb. 62-64).

Raupe an Holzarten der Familie Rosacae, auch an *Quercus*, selten schädlich. Überwinterung als Ei, zuweilen auch Imago. Waldsteppe, Waldränder, trockene Lehnen mit Gebüsch usw.

Acleris aspersana (Hübner, 1817)

Puppe 7,3-8,5 x 1,9-2,3 mm (5♂, 5 ♀ aus der Slowakei, Mähren und Dänemark), hell rotbraun, Exuvie heller. Kopf und Thorax relativ fein skulpturiert, Frons zwischen den Antennae etwas bauchartig (Abb. 66) Mittelhüften grenzen an die Vorder- wenigstens 2x länger als an die Mittelbeine (Abb. 73), lang und schmal. Antennae überragen die Mittelbeine deutlich, Vorderflügel unter der Spitze kaum konkav (Abb. 73). Pronotum frontal ein bisschen ausgeschnitten (Abb. 67), Metanotum mittellang, Ausschnitt breit (Abb. 68). 2. Segment mit rd. 13 stumpfen Dornen der Kaudalreihe, 3.-6. Segment mit 4 Dornen der Basal- und 11-15 denen der Kaudalreihe zwischen den Dorsalborsten. Insbesondere am 3. Segment die Dornen der Basalreihe wenig grösser als die der Kaudalreihe. 9. Segment mit etwa 8 Zähnen, die etwas kleiner als die am 8. sind. Kremaster ventral und lateral, Kaudalhälfte auch dorsal stark gerunzelt. Ausläufer gross, breit, dazwischen ausgeschnitten und deshalb etwas zweilappig (Abb. 69-71).

Raupe an Kräutern aus der Familie Rosaceae, an *Filipendula, Spiraea, Dryas, Salix* u.a. Überwinterung meist als Ei. Offene Landschaft, bei Gewässern usw.

Acleris ferrugana (Denis & Schiffermüller, 1775)

Puppe 7,5-8 x 1,9-2,4 mm (2 ♀ aus der Slowakei), hellbraun, Exuvie bleich bräunlich weissgelb, heller als die untersuchten *A. notana*. Skulptur relativ fein. Frons zwischen den Antennae nur schwach bauchig (Abb. 74). Vorderhüften grenzen relativ länger aneinander, Mittelhüften kaum, oder wenig länger an die Vorder- als an die Mittelbeine (Abb. 75). Antennae überragen die Mittelbeine höchstens wenig (Abb. 76). Vorderflügel unter der Spitze kaum konkav. Pro- und Metanotum denen bei *A. notana* ähnlich. Dornen am Abdomen relativ klein, schwach sklerotisiert, breit, steil, die der Basalreihe relativ wenig grösser als die der Kaudalreihe (Abb. 77). Am 2. Segment rd. 14 denen der Kaudal-, am 3.-6. Segment 6-7 Dornen der Basal- und 13-16 denen der Kaudalreihe zwischen den

Dorsalborsten. Am 8. Segment Dornen der Kaudalreihe klein und wenig zahlreich, am 9. nur 6-8 kleine, breite Dornen. Kremaster mit starken Leisten und Runzeln, Ausläufer relativ schwach, dazwischen mässig konvex, kaum ausgeschnitten (Abb. 78-80).

Raupe an *Quercus*, *Fagus*, angeblich auch *Salix*, Überwinterung meist als Imago Vorwiegend in Eichen- und Eichenmischwäldern.

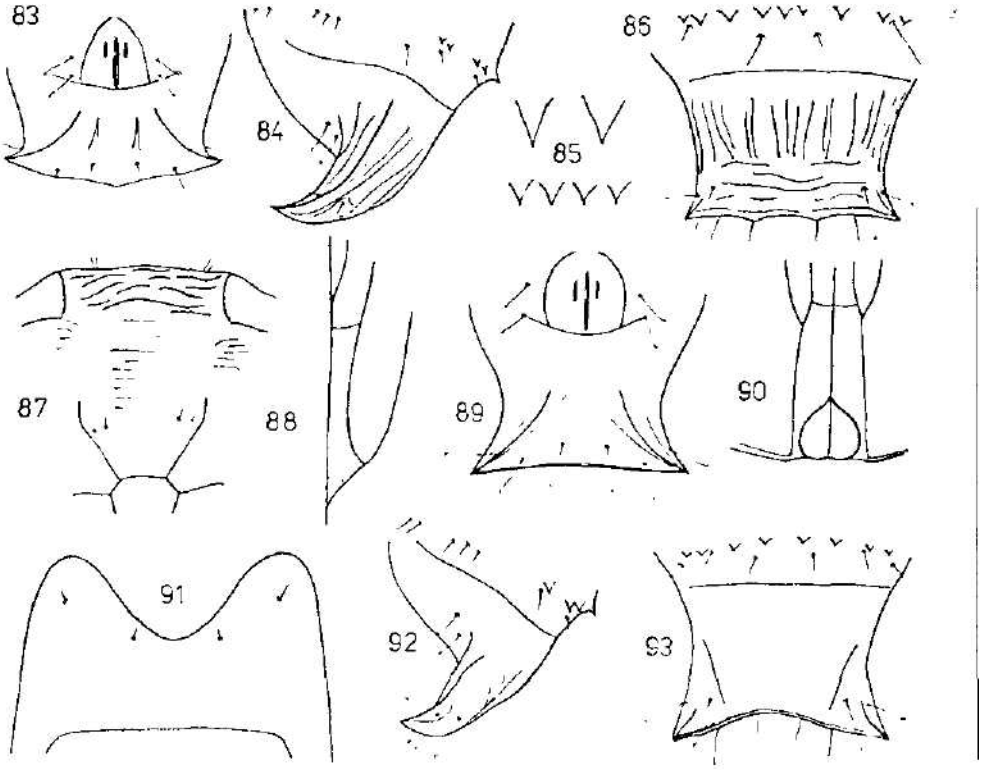

Abb. 83-86. *Acleris notana*, 87-93 *A. shepherdana*: 83, 89 - Abdominalende in Ventral- , 84, 92 - in Lateralsicht, 85 - Dornen der Basal- und Kaudalreihe am 5. Abdominalsegment, 86, 93 - Abdominalende in Dorsalsicht, 87 - Frons, Clypeus, Labrum, 88 - Mittelhüfte und Umgebung, 90 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 91 - Metanotum.

Acleris notana (Donovan, 1806)

Puppe 7,5-8,5 x 2,0-2,6 mm (5 ♂, 5 ♀ aus der Slowakei), rötlichbraun, Exuvie heller. Skulptur relativ fein, Stirn und Clypeus mässig gerunzelt. Mittelhüften grenzen an die Vorderbeine um 1/4 bis 1/3 länger als an die Mittelbeine. Antennae überragen die Mittelbeine kaum oder wenig, Vorderflügel unter der Spitze kaum konkav. Pronotum frontal ein bisschen konkav, subdorsal am Kaudalrand ausgebuchtet, Metanotum mittellang, Ausschnitt abgerundet, ähnlich wie auch die frontolateralen Ausläufer. 2. Abdominalsegment mit etwa 12 spitzen Dornen der Kaudal-, 3.-6. Segment mit 3-4 Dornen der Basal- und nur 6-10 denen der Kaudalreihe zwischen den Dorsalborsten. Dornen relativ dünn und grösser als bei *A. ferrugana*, dunkler sklerotisiert, die der Basalreihe deutlich grösser als die der Kaudalreihe (Abb. 85). 9. Segment mit 7-9 Zähnen etwa so gross wie die der Basalreihe am 8. Segment. Kremaster mit starken Leisten und Runzeln, Ausläufer relativ grösser als bei *A. ferrugana* dazwischen etwas lappig (Abb. 83, 84, 86).

Raupe bevorzugt Betulaceae, hauptsächlich *Betula*, gerne an der Vorverjüngung, an den Birkenkulturen zuweilen schädlich. Die Imago überwintert. Bevorzugt sauere Standorte.

Acleris shepherdana (Stephens, 1852)

Puppe 8 x 2,3 mm (1 ♀ aus Mähren), relativ gedrungen, trüb braun, Exuvie heller. Frons und Clypeus stark gerunzelt, Frons zwischen den Antennae flach, kaum gebaucht (Abb. 87). Mittelhüften grenzen wenigstens 3 x länger an die Vorder-, als an die Mittelbeine, Antennae überragen die Mittelbeine nur wenig (Abb. 88,90). Vorderflügel mit rauher Skulptur. Pronotum dem bei *A. ferrugana* ähnlich, Metanotum ziemlich kurz, Ausschnitt stark abgerundet (Abb. 91). 2. Abdominalsegment mit 14 dichten und stumpfen Dornen der Kaudal-, 3.-7. Segment mit 4(3) Dornen der Basal- und 12-14 denen der Kaudalreihe zwischen den Rückenborsten, Dornen der Basal-relativ wenig grösser als die der Kaudalreihe. Am 8. und 9. Segment fehlt die Kaudalreihe, die Dornen dünn und kleiner als an den vorgehenden Segmenten. Kremaster hauptsächlich ventral und lateral mit mittelstarker Leisten- und Runzelskulptur, Ausläufer gross, dazwischen Kaudalrand mässig eingebuchtet (Abb. 89, 92, 93).

Raupe an *Filipendula, Aruncus, Sanguisorba, Alchemilla*. Überwintert wahrscheinlich das Ei. Um Gewässer, an feuchten Standorten.

Acleris schalleriana (Linnaeus, 1761)

Puppe 8-8,5 x 2,1-2,2 mm (2 ♂ aus der Slowakei), trub braun, feinskulpturiert. Vertex, Frons, Clypeus nur fein gerunzelt, Vorderflügel relativ glatt. Frons zwischen den Antennae mässig bauchig, Labrum lateral nicht konkav (Abb. 94). Mittelhüften grenzen an die Vorderbeine nur wenig länger als an die Mittelbeine (Abb. 98). Antennae viel länger als diese, ragen zum Niveau der sichtbaren Enden der Hinterbeine (vgl. Abb. 110). Pronotum relativ breit, frontal konvex, kaudolateral konkav. Metanotum mittelkurz, Ausschnitt abgerundet, Leistengebilde fehlen (Abb. 99). 2. Abdominalsegment mit 12-14 relativ spitzen Dornen der Kaudal-, 3. Segment mit 6-8 denen der Basal- und 12-14 Dornen der Kaudal- (diese kaum kleiner als die der Basalreihe) zwischen den Dorsalborsten. Am 4.-8.

Segment 3-4 Dornen der Basal- und 12-14 denen der Kaudalreihe, am 7.-8. nur 5-7 von diesen zwischen den Dorsalborsten. Die Grösse der Dornen der Basalreihe und den Grössenunterschied gegenüber die Kaudalreihe wächst kaudalwärts an. Am 9. Segment rd. 8 Dornen, etwas kleiner als an den vorgehenden Segmenten. Kremaster relativ lang, mässig gerunzelt, Ausläufer gross, dazwischen kaum ausgeschnitten (Abb. 95-97).

Raupe an *Viburnum*, die Imago überwintert. Waldsteppe, aber auch Auen.

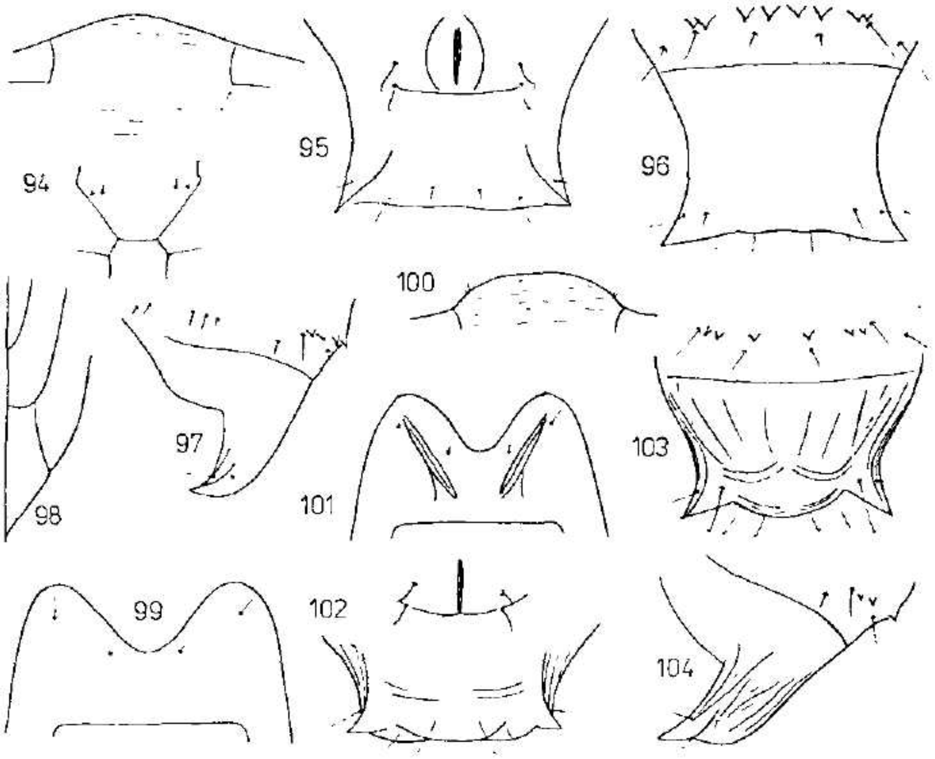

Abb. 94-99. *Acleris schalleriana*, 100-104 *A. logiana*: 94, 100 - Frons, Clypeus, Labrum, 95, 102 - Abdominalende in Ventralsicht, 96, 103 - in Dorsal-, 97, 104 - in Lateralsicht, 98 - Mittelhufte und Umgebung, 99, 101 - Metanotum, 100 - Frons.

Acleris variegena (Denis & Schiffermüller, 1975)

Puppe 7,5-8,5 x 2,1-2,3 mm (2 ♂, 1 ♀ aus der Slowakei), rotbraun, Exuvie heller. Suturae am Kopf sehr scharf, dick, dunkel. Frons hinten stärker gerunzelt, kaum bauchig (Abb. 105). Mittelhüften lang, schmal, grenzen an die Vorderbeine wenigstens 2 x länger als an die Mittelbeine (vgl. Abb. 72). Antennae überragen die Mittelbeine lang, ragen oft nahe der Spitze der Vorderflügel (Abb. 110), diese unter der Spitze kaum konkav, mit mittelfeiner Zellenskulptur. Pronotum kurz, frontal ein bischen konkav, hinten schwach bauchig. Metanotum mittelkurz, Ausschnitt relativ schmal-, frontolaterale Ausläufer breit abgerundet. (Abb. 106). Die Kaudalreihen der Dornen mit 10-12 (14) spitzen Dörnchen, die Basalreihen mit 3-4 deutlich grosseren- zwischne den Dorsalborsten. Am 7.-8. Segment die Dornen der Basalreihe grösser, die der Kaudalreihe kleiner. 9. Segment mit 7-8 Dörnchen, diese auch relativ gross. Kremaster lateral und im Kaudalteil mit stärkeren Leisten und Runzeln, dazwischen in Dorsalsicht seicht konkav (Abb. 107-109).

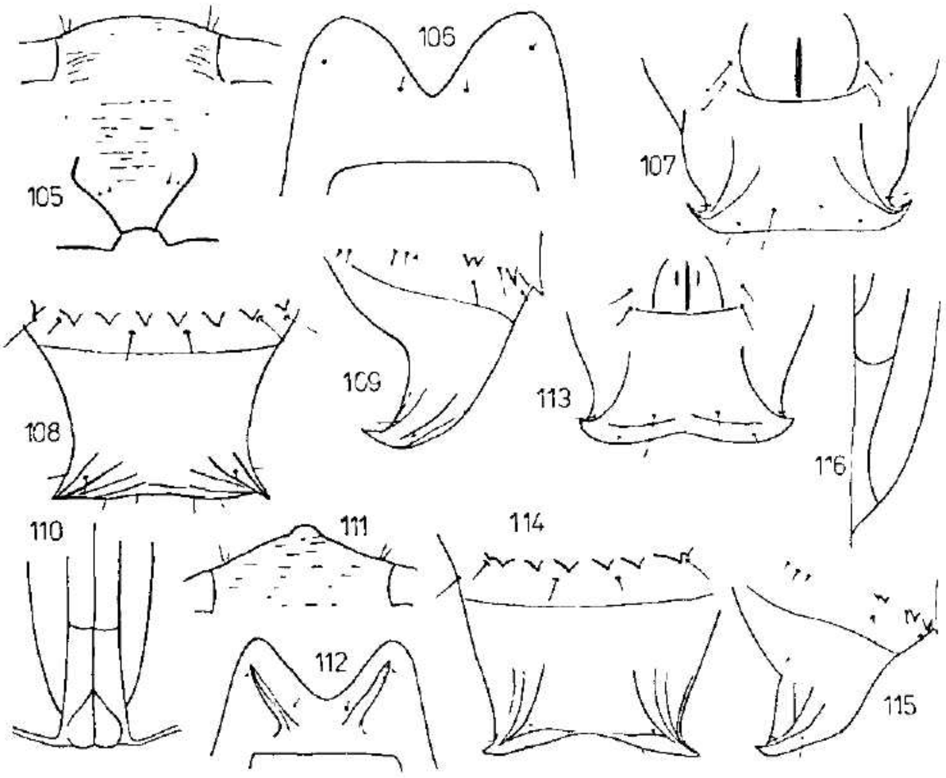

Abb. 105-110. *Acleris variegana*, 111-115 *A. logiana*, 116 *A. hastiana*: 105 - Frons, Clypeus, Labrum, 106, 112 - Metanotum, 107-113 - Abdominalende in Ventral-, 108, 114 - in Dorsal-, 109, 115 - in Lateralsicht, 110 - Endteil der Mittel- und Hinterbeine, Antennae und Flügel, 111 - Frons, 116 - Mittelhüfte und Umgebung.

Raupe an Sträuchern und Kräutern vorwiegend der Familie Rosaceae, als Schädling ziemlich belanglos, Überwinterung meist als Imago. Buschige Lehnen, Waldsteppe, Waldränder.

Acleris boscana (Fabricius, 1794)

Puppe 8-9,5 x 2,1-2,4 mm (1 ♂, 2 ♀ aus der Slowakei und Zool. Staatssammlung München), rotbraun, Exuvie heller, orange braun. Skulptur mittelfein, Frons, Clypeus, Oculi gerunzelt, Vorderflügel mit Zellskulptur. Frons zwischen den Antennae stark erhaben, stumpf kegelförmig oder knopfartig (Abb. 111). Mittelhüften grenzen beiläufig gleichlang an die Vorder- und Mittelbeine (vgl. Abb. 98). Antennae überragen deutlich die Mittelbeine, nicht aber bis zum Niveau der sichtbaren Enden der Hinterbeine (vgl. Abb 44). Vorderflügel höchstens schwach konkav unter der Spitze. Metanotum mit breiten Auschnitt, frontolaterale Ausläufer abgerundet, deutlich schräge Leisten entwickelt (Abb. 112). 2. Abdominalsegment mit 18 stumpfen Dornen der Kaudal-, 3. Segment mit 3 denen der Basal- und 14, etwas kleineren, der Kaudal-, 4.-7. Segment mit 3-4 Dornen der Basal- und 10-14 denen der Kaudalreihe zwischen den Dorsalborsten. Dornen der Basalreihe am 5. Segment steil und viel grösser als die der Kaudalreihe. Dornen der Basalreihe am 8. und 9. Segment etwas kleiner als die der vorigen, am 9. Segment insgesamt nur rd. 5 Dornen. Kremaster hauptsächlich im Kaudalteil und an den Seiten mit starken Leisten und Runzeln, zwischen den Ausläufern etwas ausgeschnitten (Abb. 113-115).

Raupe an *Ulmus*, bivoltine Art, die Imago überwintert. Vorwiegend Auen grösserer Flüsse.

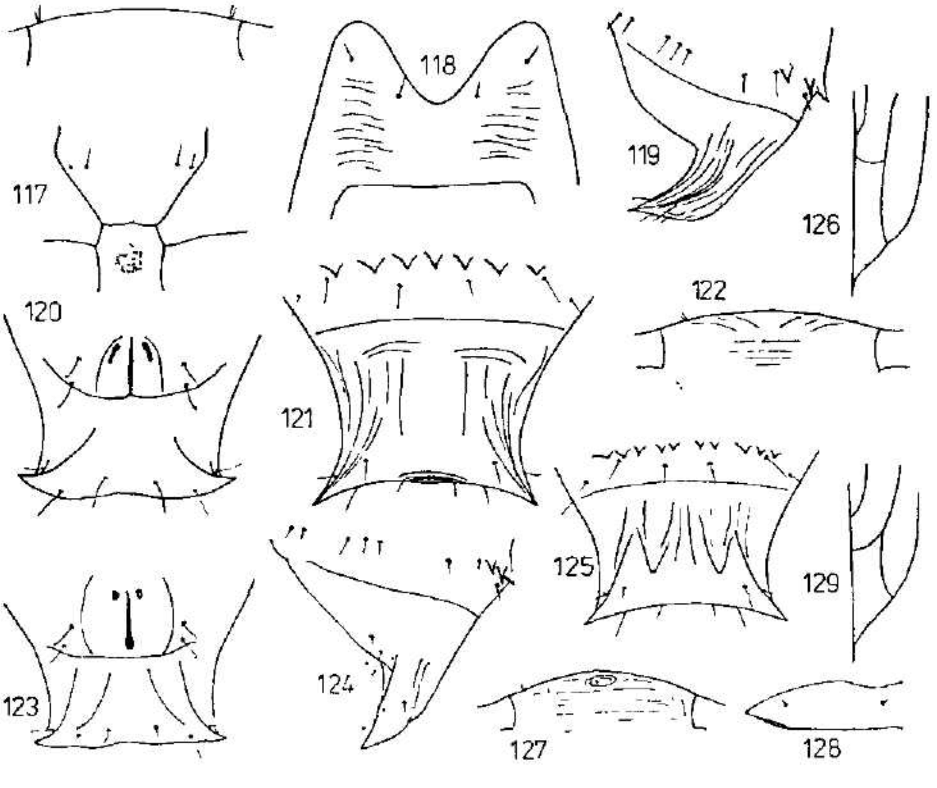

Abb. 110-121. *Acleris hastiana*, 122-125 *A. lorquiniana*, 126-128 *A. abietana*, 129 *A. emargana*: 117 - Frons, Clypeus, Labrum, Labium, 118 - Metanotum, 119, 124 - Abdominalende in Lateral-, 120, 123 - in Ventral-, 121, 125 - in Dorsalsicht, 122, 127 - Frons, 126, 129 - Mittelhüfte und Umgebung, 128 - Pronotum (linke Hälfte).

Acleris logiana (Clerck, 1759)

Puppe 9,8 x 2,1 mm (1 ♂ aus der Zool. Staatssammlung Munchen), schlank, rotbraun. Exuvie satt rötlich gelbbraun (Puppe rotbraun). Frons gerunzelt, zwischen den Antennae deutlich breit bauchig (Abb. 100). Mittelhüften grenzen wenig länger an die Vorder- als an die Mittelbeine (vlg. Abb. 129). Antennae überragen die Mittelbeine kaum (vgl. Abb. 141). Pronotum relativ schmal. Metanotum mit deutlichen schragen Leisten, ahnlich wie bei *A.boscana* (Abb. 101). Am 2.-7. Abdominalsegment nur 7-10 Dornen der Kaudal- am 3.-7. Segment 3-4 Dornen der Basalreihe zwischen den Dorsalborsten. Am 5.Segment die Dornen der Basalreihe viel grosser als die der Kaudalreihe. Am 9. Segment nur rd. 6 relativ kleine Dornen. Kremaster mit starken Runzeln und Leisten, insbesondere lateral und im Kaudalteil. Zwischen den schlanken Auslaufern hinten etwas bauchig (Abb. 102-104).

Raupe an Birken, die Imago uberwintert. Vorwiegend Birkenbestande an saueren Boden.

Acleris hastiana (Linnaeus, 1758)

Puppe 10-12 x 2,4-2,8 mm (5 ♂, 5 ♀ aus der Slowakei und Danemark). Frons und Clypeus *gerunzelt, Frons zwischen den Antennae kaum bauchig (Abb. 117). Labium im* Mittelteil und Vorderflugel mit rauher Skulptur. Mittelhuften lang und schlank, grenzen an die Vorderbeine wenigstens 3 x langer als an die Mittelbeine (Abb. 116). Antennae uberragen die Vorderbeine nicht allzu weit (vgl. Abb.90). Vorderflugel unter der Spitze kaum konkav. Pronotum relativ lang, Metanotum mittellang, lateral quergerunzelt, ohne Leistengebilde (Abb. 118). Am 2.-7. Abdominalsegment 8-12 Dornen der Kaudal-, am 3.-7. Segment 3-4 denen der Basalreihe zwischen den Dorsalborsten. Am 5. Segment Dornen der Basalreihe deutlich grosser als die der Kaudalreihe. Am 9. Segment 10-15 relativ grosse Dornen. Kremaster mit starken Leisten und Runzeln, hauptsachlich lateral, zwischen den schlanken Auslaufern sanft ausgebuchtet (Abb. 119.121).

Raupe an *Salix*, meist bivoltin, die Imago uberwintert. Um Gewasser.

Acleris lorquiniana (Duponchel, 1835)

Puppe 8,5-10,5 x 2,0-2,5 mm (2 ♂, 2 ♀ aus Schweden) schwarzbraun mit helleren Einschnitten. Skulptur ziemlich fein, Frons und Clypeus nur schwach gerunzelt, ziemlich glänzend. Vorderflugel fein chagriniert. Frons zwischen den Antennae relativ flach (Abb. 122). Mittelhuften grenzen etwa 2 x langer an die Vorder- als an die Mittelbeine (vgl. Abb 126). Antennae uberragen die Mittelbeine stark, bis zum Niveau der sichtbaren Enden der Hinterbeine bzw. Spitzen der Vorderflugel (vgl. Abb. 138). 2.-7. Abdominalsegment mit 17-22 Dornen der kaudal-, 3.-7. Segment mit 6-7 denen der Basalreihe zwischen den

Dorsalborsten. Dornen der Basalreihe am 5. Segment schlank, viel grösser als die der Kaudalreihe. Am 9. Segment 8-10 kleinere relativ breite Dornen. Kremaster mittelstark gerunzelt, hinten sanft ausgebuchtet, Häkchen stark (Abb. 123-125).

Raupe an *Lythrum*, bivoltin, die Imago überwintert. Um Gewässer.

Acleris abietana (Hübner, 1822)

Puppe 8-10 x 2,5-2,8 mm (2 ♂, 2 ♀ aus der Slowakei) rötlich braun, Exuvie heller Clypeus deutlich quer-, Frons auch länglich gerunzelt, Vorderflügel und auch Metanotum fein, rauh chagriniert. Frons zwischen den Antennae ganz schwach bauchig (Abb. 127) Mittelhüften grenzen wenigstens 2 x länger an die Vorder- als an die Mittelbeine (Abb 126). Antennae überragen die Mittelbeine kaum oder wenig (vgl. Abb. 90). Vorderflüge unter der Spitze kaum konkav. Pronotum frontal vor der Mitte etwas ausgeschnitten (Abb 128). Metanotum mittelkurz, Auschnitt breit abgerundet, ohne Leistengebilde. Am 2 Abdominalsegment rd. 20 relativ stumpfe Dornen der Kaudal-, am 3.-5. Segment 3-5 Dornen der Basal- und etwa 17 denen der Kaudal-, am 6.-8. Segment 3-5 Dornen der Basal- und 12-14 denen der Kaudalreihe zwischen den Dorsalborsten. Am 5. Segment die Dornen der Basalreihe viel grösser als die der Kaudalreihe. Am 9. Segment 7-12 breite Dornen. Kremaster mit starken Leisten und Runzeln, relativ grossen Ausläufern, dazwischen sanft konkav. Endhäkchen recht fein (Abb. 131-133).

Raupe an Nadelhözern insbesondere an Tannen und Fichten. Meist univoltin, Imago überwintert meistens, in Nadelhölzern.

Acleris emargana (Fabricius, 1775)

Puppe 8,5-10,5 x 2,5-2,9 mm (5 ♂, 5 ♀ aus der Slovakei), rötlich braun, Exuvie heller Frons, Clypeus gerunzelt, Labium in der Mitte, Vorderflügel zwischen den Adern, Metanotum im Mittelteil rauh skulpturiert. Frons zwischen den Antennae relativ flach abgerundet (Abb. 127). Mittelhüften grenzen an die Vorderbeine etwas (höchstens um 1/3) länger als an die Mittelbeine (Abb. 129). Antennae überragen weit die Hinterbeine, beinahe zur Spitze der Vorderflügel, unter welcher die Flügel deutlich konkav sind (Abb. 128). Pronotum vorne mässig konkav, hinten im Subdorsalgebiet ausgebuchtet. Metanotum mit etwas schmälerem Ausschnitt als bei *A. abietana*, Leistengebilde angedeutet (Abb. 134). Basalreihen am Abdomem mit 3-4, Kaudalreihen mit 12-14 Dornen zwischen den Dorsalborsten. Am 5. Segment die Dornen der Basalreihe viel grösser als die der Kaudalreihe. Am 8. Segment die Kaudalreihe nur mit 6-8 kleinen, am 9. Segment die Basalreihe mit 6-9 grossen Dornen. Kremaster ventral und lateral mit starken Leisten und Runzeln, Dorsalseite feiner skulpturiert. Ausläufer stark, spitz, dazwischen zwei Lappen. Häkchen fein (Abb. 135-137).

Raupe an Salicaceae und Betulaceae, hauptsächlich an *Salix*, meistens univoltin, die ago überwintert. Bei Gewässern.

Acleris literana (Linnaeus, 1758)

Puppe 10,5 x 2,4 mm (1 ♀ aus der Slowakei), rötlich braun, Exuvie heller. Skulptur n an der Stirn rauh, am Clypeus feiner quergerunzelt, Vorderflügel und Metanotum Papillenskulptur. Stirn mit einem grossen, an der Basis etwas eingeschnürten Höcker,

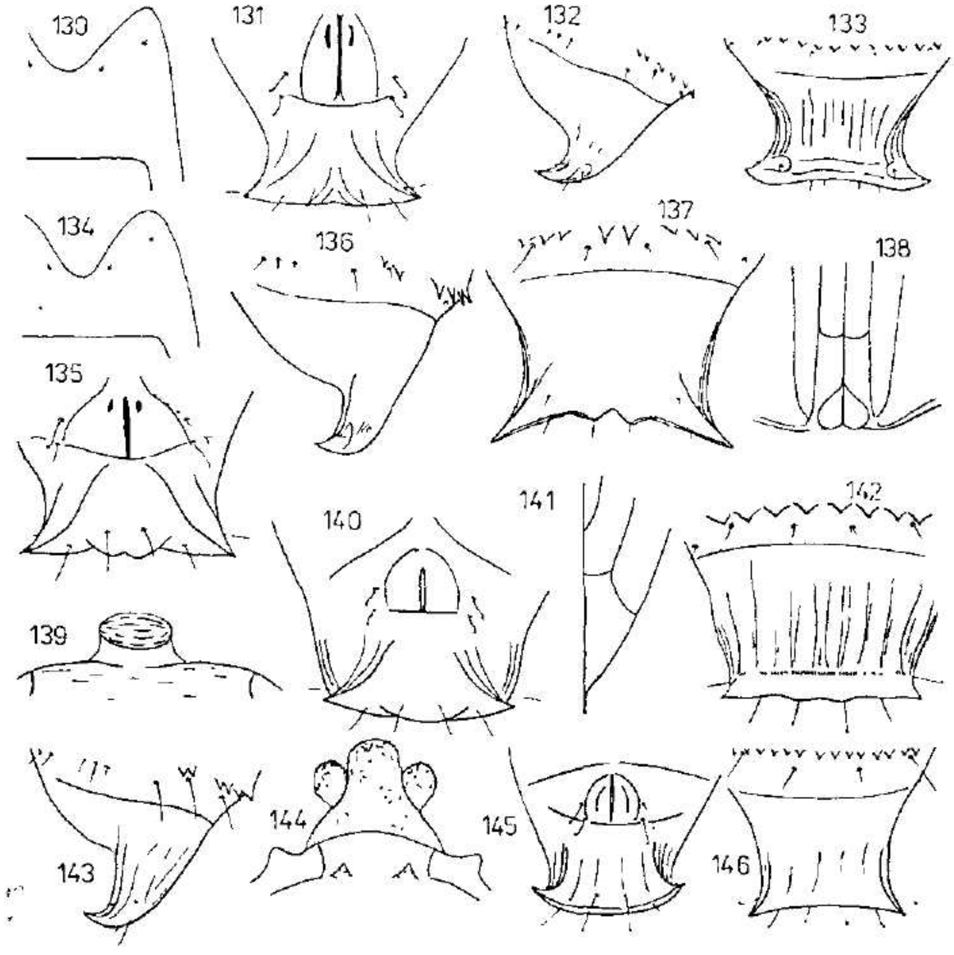

Abb. 130-134. *Acleris lorquiniana*, 135-138 *A. emargana*, 139-142 *A. literana:* 130, 134 - Metanotum, 131, 135, - Abdominalende in Ventral-, 132, 136 - in Lateral-, 133, 137, 142 - in Dorsalsicht, 138 - Endteil in der el- und Hinterbeine, Antennae und Flugel, 139 - Frons, 141 - Mittelhufte und Umgebung, 143-146 Acleris riana: 143 - Abdominalende in Lateral-, 145 - in Ventral-, 146 - in Dorsalsicht, 144 - Frons, Würzel der nnae , Clypeus.

oben rauh (Abb. 139). Mittelhüften grenzen etwas kürzer an die Vorder- als an di Mittelbeine (Abb. 141). Antennae überragen die Mittelbeine kaum (vgl. Abb. 15 Vorderflügel unter der Spitze kaum konkav, Pronotum vorne vor der Mitte etwas ein- hinten subdorsal ausgebuchtet. Metanotum mittelkurz. Auslaufer stumpf abgerundet (vgl Abb. 53). Am 2. Segment rd 18 kleine Dornen der Kaudal-, 3.-7. Segment mit 3-4 dunne Dornen der Basal- und 9-14 viel kleineren Dornen der Kaudalreihe zwischen de Dorsalborsten. Am 8.-9. Segment 8-10 steile, meittegrosse Dornen der Basalreihe Kremaster mit kürzeren, spitzen Ausläufern, hinten mit ganz kleinen Lappen dazwischen stark gerunzelt und mit Leisten, Dorsalseite mit einem bogenförmigen Querwall in Kaudalteil (Abb. 140, 142, 143).

Raupe hauptsächlich an *Quercus*. Die Imago überwintert. In Eichenwaldern.

Acleris fimbriana (Thunberg, 1791) (mit gen. aest. *lubricana* (Mann, 1867))

Puppe 9-10 x 2,0-2,3 mm (1 ♂, 2 ♀ aus der Zoologischen Staatssammlung München), rotbraun, verdunkelte Stellen fast schwärzlich, Exuvie heller, rauh skulpturiert. Frons zwischen den Antennae mit einem grossen, rauhen, dreilappigen Ausläufer (Abb. 144). Clypeus und Basis der Antennae mit je einem Höcker (bei der Puppe der gen. aest. *lubricana* befand sich noch ein weiterer kleiner Hocker an der Basis der Antennae). Labium in der Mitte stark rauh skulpturiert. Am 2. Abdominalsegment 8-11 Dornen der Kaudal-, am 3.-7. Segment Basalreihe mit 4-7, Kaudalreihe mit 17-21, ausnahmsweise mit nur 14 Dornen zwischen den Dorsalborsten. Am 9. Segment 12-15 kleine Dornen. Kremaster mit starken Leisten und Runzeln, Ausläufer ziemlich klein, dazwischen höchstens schwach ausgeschnitten, praktisch ohne Ausläufer (Abb. 145, 146).

Raupe an *Prunus spinosa*, angeblich auch *Vaccinium*, bivoltin, die Imago überwintert. An buschigen Lehnen und Heiden.

DISCUSSION

Die Tribus Tortricini kann man mit Hilfe der Puppenmerkmale gut und eindeutig charakterisieren, sie bildet eine geschlossene Gruppe. Die Gattungen *Tortrix* und *Aleima* weichen von den übrigen stärker ab und sind auch voneinander eindeutig unterscheidbar. Die Gattungen *Croesia* und *Acleris* sind puppenmorphologisch einander ahnlich und *C. bergmanniana* entspricht eher einer *Acleris* als *Croesia*. Die artenreiche Gattung *Acleris* bildet puppenmorphologisch eine einheitliche, geschlossene Gruppe. Auffällig sind die Arten mit grossen frontalen Auswüchsen, deren Funktion mir unbekannt bleibt. Sie kommen übrigens auch bei anderen Gruppen der Tortricidae vor. Die Art der Verpuppung und des Schlüpfens der Imago ist bei den betreffenden Arten kaum von den übrigen *Acleris* verschieden. Alle untersuchten Taxa kann man an Hand der Puppenmerkmale charakterisieren und bestimmen.

ZUSAMMENFASSUNG

Die zur Verfügung stehenden Puppen der mitteleuropaischen Vertreter der Tribus *Tortricini (Lepidoptera, Tortricidae)* - 4 Gattungen, 22 Arten - werden charakterisiert, durch Federzeichnungen dargestellt, Bestimmungstabellen der Gattungen und Arten werden beigefugt. Die Biotope, Nährpflanzen der Arten, Art der Überwinterung werden kurz erwähnt. Die Stellung der untersuchten Taxa in dieszeitigem System der Lepidopteren wird auf Grund der Puppenmerkmale diskutiert.

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NOTE ON THE EAST - AFRICAN BARBEL, BARBUS INTERMEDIUS (CYPRINIDAE, OSTEICHTHYES) FROM KITO PASS, NORTHERN KENYA

Czech Virunga Expedition 1978 - 1979

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Abstract. In the two pools of seasonal streams in Kito Pass (Suguta basin), Northern Kenya, 26 specimens of *Barbus intermedius* Ruppell, 1837 were collected in January 1979. The description of this material is given. The author suggests that the separation of this species into two subspecies, *Barbus intermedius intermedius* and *B. i. australis*, is not real.

INTRODUCTION

In the present paper I am discussing a revision of *Barbus intermedius* published by Banister (1973). According to this author, *Barbus intermedius* is widely distributed throughout Southern Ethiopia and into Northern Kenya. In the latter region, certainly, as far as inclusively Lake Baringo, northward in the Uasso Nyiro river (syn. Ewaso Ngiro) and in the Lake Turkana (Rudolf) basin (the Kerio river).

Banister (1973) in his revision of the large African *Barbus* recognized two subspecies in the species *Barbus intermedius*, *B. i. intermedius* and a new subspecies, *B. i. australis*. The latter is known from Lake Baringo only. My own material was collected from the localities between Lake Baringo and Lake Turkana.

MATERIAL AND METHODS

The Kito Pass - Tiati - Mugor line creates the watershed between Kerio and Suguta rivers (Mason & Gibson, 1957) Kito Pass lies in the northwest direction between the slopes of Chepanda Hills in the west and the massif of Lokitet in the north Seasonal streams drain the rain water from the altitude 1.300 - 1 524 m southeastward during the highest intensity of the rainfall into the basin of Suguta Valley - i.e., into the Suguta river. The water is hard (an electric conductivity at 25°C 650 micromhos/cm^3. pH 7.2; carbonate hardness as $CaCO_3$ is 24; alkalinity as $CaCO_3$. carbonate O. bicarbonate 260; data in ppm - personal communication of Dr Jukka Jarhula, Kapede Hospital, Kenya, Finnish Mission)

Suguta is a seasonal river. In the section between Kapedo (hot springs and a hot waterfall from the geological bed of Silali Volcano - as an underground outlet from the Lake Baringo) and Kamige Ekalate, i.e., a sector of ca 60 km, the Suguta river has a permanent flow Northwards it forms mud flats and the soda lake Logipi Namakat. According to Willis (1936, see also Beadle, 1932), the water level of Lake Baringo was originally about 15 m higher and the water inundated lower plateaus northwards from this lake.

Water in Kapedo Fall has less pH than in Lake Baringo (8 8), a higher concentration of cations Na (137) than in L Baringo (111), higher Cl anion concentration (48) than in L Baringo (31) and lower SO_4 anion concentration (24) than L Baringo (29 65) - see Visser (1974)

In the recent geological time, Teleki's Volcano and Mt Kakorinya closes the Suguta Valley opposite to the south part of Lake Turkano (Rudolf)

The nameless seasonal streams in Kito Pass form an outletless basin in dry season with great numbers of shallowpools The beds of these pools are formed by sand and stones, without aquatic plats In two pools located at 5°54'E, 1°04'N,26 specimens of Barbus were collected in January 1979

Plastic characters (all measurements on the left side of the body), were calculated in percentage of the body length, the head length, the total length and the caudal peduncle length The head length was measured together with the width of the branchiostegal membrane The "dorsal spine" is the length of the last unbranched ray in the dorsal fin and it was measured from its base to the proximal articulation "Dml - Ll" in Table 2 and 3 are scale between the dorsal mid-line and the lateral line "Ll - V" are scale rows between the lateral line and the base of the ventral fin.

RESULTS AND DISCUSSION

Snout of our specimens from Kito Pass in humped on the dorsal part. The head length is longer (in average) than the maximum body width. These specimens differ (stated in spite of the small number of specimens in collection) from both subspecies by a relatively longer head (see Banister, 1973). This is probably due to the small ranges of the body length of fishes from Kito Pass. They also have slightly smaller body depth than the lacustrin subspecies B. i. australis from Lake Baringo.

The margin of the dorsal fin is concave and the fourth unbranched ray is without denticles and it is situated on the posterior side. The base of the dorsal fin begins in front of or vertically to the origin of ventral fins. The length of the longest unbranched ray of dorsal fin is larger in specimens from Kito Pass when compared to both described subspecies by Banister (l.c.). The anal fin does not reach the beginning of the caudal fin and pectorals do not reach the origin of the ventral fins.

The variability of key characters corresponds with the categorization of those which appear to be modified by environment according to Vladykov (1934) for cold-water fishes.

The lateral line has a banded course, having mostly 31-32 scales (Fig. 1). They are no evident differences in the number of scales in our specimens in comparison to *B. i. intermedius* and *B. i. australis* according to Banister (l.c.). Scales are cycloid, radial canals source parallel to the long axis of the scale. There are twelve scales around the caudal peduncle (25 specimens) or fourteen (1 specimen).

The length of the posterior barbel is larger than the minimum body depth. The length of the caudal peduncle is larger in specimens from Kito Pass than in *B. i. australis* and the lower limit of ranges in higher than the same of *B. i. intermedius*.

On average, the minimum body depth is larger than that of *B. i. intermedius* and it corresponds to the average in *B. i. australis*.

Table 1 Plastic characters of ***Barbus intermedius*** Ruppell, 1837 from Kito Pass (Suguta River) Northern Kenya

Characters	Averages	Ranges
Total length (in mm)	88 4	52 5 - 145 0
Body length (in mm)	68 0	40 5 - 110 0
In % of the body length		
Body depth	27 7	24 6 - 31 3
Body width	15 5	12 3 - 19 5
Head length	30 4	28 2 - 34 8
Head depth	20 2	17 2 - 21 7
Head width	16 8	14 9 - 18 0
Predorsal distance	53 1	50 0 - 57 1
Caudal peduncle length	18 5	15 5 - 20 7
Minimum body depth	12 4	10 9 - 14 0
Preventral distance	53 6	51 4 - 57 6
Preanal distance	78 0	75 3 - 81 3
P - V distance	23 9	18 2 - 28 2
V - A distance	26 3	23 4 - 29 1
Length of dorsal fin	15 1	13 0 - 17 0
Depth of dorsal fin	27 8	25 5 - 31 1
Length of anal fin	7 9	6 9 - 9 4
Depth of anal fin	20 1	17 3 - 22 0
Length of pectoral fin	22 6	19 6 - 24 6
Length of ventral fin	19 1	17 0 - 22 0
Diameter of eye	7 9	6 6 - 9 1
In % of the total length		
Head length	23 5	21 5 - 26 6
Body depth	20 6	18 9 - 24 4
In % of the head length		
Head depth	66 3	60 6 - 73 8
Head width	55 3	49 3 - 62 5
Diameter of eye	25 9	20 8 - 31 3
Preorbital distance	33 0	28 3 - 37.5
Postorbital distance	47 1	42 3 - 55 2
Interorbital distance	29 9	26 3 - 32 9
Length of anterior barbel	22 4	16 2 - 28 2
Length of posterior barbel	30 8	23 3 - 39 0
Body depth	91 5	70 8 - 105 8
In % of the caudal peduncle		
Minimum body depth	67 0	60 0 - 82 3

Meristic characters of *Barbus intermedius* from Kito Pass can be determined as D IV 7 - 9, A III 5, P 11 - 14, V 9, Ll 29 - 35, L tr 5 1/2 / 5 1/2. There are 15 gill rakers on the lower limb of the first left gill arch.

During the life the upper half of the body sides are greyish-green and the lower part is yellowish.

According to Banister (1973), the distinguishing characters of two subspecies (i.e. *B. i. intermedius* and *B. i. australis*) are as follows: longer dorsal spine, longer pectoral fins, slightly deeper body and longer barbels in lacustrine *B. i. australis*.

Our specimens from Kito Pass have a slightly body depth and longer head than these two subspecies. Preorbital distance is larger than in the both subspecies, and the length of the posterior barbel is also longer. The length of pectorals is larger (on average) than in subspecies *B. i. intermedius* and slightly shorter than in *B. i. australis*.

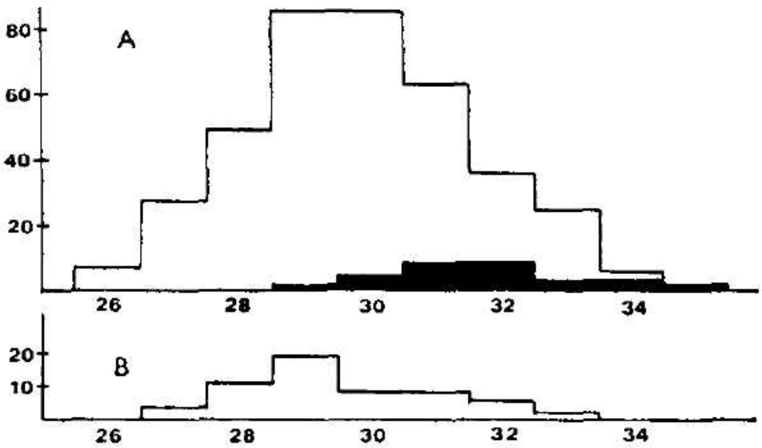

Fig. 1. Histogram of the distribution of lateral line scales in *Barbus intermedius*. A - white *B. i. intermedius* (Banister, 1973), black *B. intermedius* (Kito Pass). B - *B. i. australis* (L. Baringo - Banister, 1973).

Table 2. Meristic characters of *Barbus intermedius* Rüppell, 1837 from Kito Pass (Suguta River), Northen Kenya.

Characters	Ranges
Lateral line scales	29 - 35
Dml - Ll	5 1/2
Ll - V	3 1/2 - 4 1/2
Scales around caudal peduncle	12 - 14
Dorsal fin rays	IV 7 - 9
Anal fin rays	III 5
Pectoral fin rays	9
Ventral fin rays	11 - 14

I suppose that the question of the subspecific separation of the species *Barbus intermedius* is still open. It is a similar problem as in some species of the genus *Barbus* in Northern Africa (see Almaca, 1970), especially in Central Algerian Sahara (Tandon, 1977). It is possible that in the latter region the speciation begins to originate.

The time of the isolation of separated populations of *Barbus intermedius* in East Africa, and especially in Kenya, is relatively short for the possibility of closing the process of differentiation inside *Barbus intermedius* into two subspecies.

According to observation of Gregory (1921), Lake Baringo at its highest level flows over the Lobat Pass to the north. The present underground outlet feeds probably the springs of the Kogore Valley, which, in the distance of 8 km from the lake on the northern side of the Lobat Pass, are about 30 m below the level of Lake Baringo (Gregory, 1921; Beadle, 1932). The Kogore river is a seasonal tributary of the Suguta river with a ca. 30-- 40 m deep canyon in the distance of 6 km southward before the Kapedo warm waterfall (author's observation).

Table 3. Plastic and meristic characters of subspecies *Barbus intermedius intermedius* and *Barbus i australis* according to Banister (1973) and specimens of *Barbus intermedius* Ruppell, 1837 from Kito Pass (Suguta river), Northern Kenya

Group	1		2		3		4	
No. of specimens	388		58		26		446	
Body length (in mm)	94 - 489		66 - 388		40.5 - 110		66 - 489	
In % of the body length:	Ave.	Ranges	Ave	Ranges	Ave.	Ranges	Ave	Ranges
Body depth	28.1	20.7-37.7	30.0	26.3-35 1	27.7	24 6-31 3	28 4	20 7-37.7
Head length	26.5	19.0-31 7	26 2	23 0-31 0	30 4	28 2-34 8	26 4	19 0-31.7
Diameter of eye	6.0	3 5-10.2	6 0	4 4- 9 1	7.9	6.6- 9.1	6.0	3.5-10 2
Interorbital distance	8.0	4 7-11.6	8 1	6.1-12.3	9.1	7.5-10.2	8 0	4 7-11.6
Length of pectoral fin	21.5	15.6-29 0	23.4	21 0-27 2	22.6	19.6-24 6	21.8	15.6-29.0
Caudal peduncle length	17 0	11 7-22.9	16.1	11 7-18 7	18.5	15 5-20 7	16.9	11 7-22 9
Minimum body depth	11.5	8 6-15 0	12.7	9.5-14.2	12 4	10 9-14.0	11.6	8.6-15 0
Preorbital distance	8.6	5.4-12.7	8 7	6.7-10.7	10 0	8.5-13.0	8.5	5.4-12 7
Length of anter. barbel	5 6	1.8-11 1	7 1	4.8-10.0	6 6	4 9- 8 6	5.8	1 8-11 1
Length of poster barbel	6.7	1.9-12.1	8.4	6,0-10 9	9.5	7 0-12 3	6.9	1 9-12 1
Dorsal spine	19.1	6.9-33 9	24.9	15 6-32 3	25 8	22 4-30 6	20.1	6 9-33 9
Lateral line		26 - 34		27 - 33		29 - 35		26 - 34
Scales around caud. ped		12 - 13		12		12 - 14		12 - 13
Dml - Ll		4½ -6½		5½ - 6½		5½		4½ -6½
Ll - V		1½ - 4½		2½ - 3½		3½ -4½		1½ -4½
Rays of dorsal fin		IV 8-9		IV 8-9		IV 7-9		IV 8-9
Rays of anal fin		III 5		III 5		III 5		III 5

Group 1: The characters of the specimens of *Barbus i intermedius* distributed throughout Southern Ethiopia and into Northern Kenya without Lake Baringo (according to Banister, 1973).

Group 2: The characters of the specimens of *B i. australis* from Lake Baringo, Northern Kenya (Banister, 1973).

Group 3: The characters of the specimens of *B i intermedius* from Kito Pass, Northern Kenya

Group 4: The characters of all specimens from groups 1 and 2 (Banister, 1973)

I suppose that this is the possible way of the occasional migration of the populations of this barbel's species between the Lake Baringo basin and the Suguta river.

CONCLUSION

In the pools of the seasonal streams in Kito Pass (Suguta basin), Northern Kenya, 26 specimens of *Barbus intermedius* were collected in January 1979 by the author.

Plastic and meristic characters were compared with the previous revision of Barbus intermedius by Banister (1973) concerning unification of several barbel species into one species *Barbus intermedius*. This revision of the species *B. intermedius* is accepted; however, I do not agree with the subspecific separation of the subspecies *B. intermedius australis*.

The plastic characters show large variability in the whole area of extending (Table 3).

The meristic characters of *Barbus intermedius* from Kito Pass are as follows:

D IV 7 - 9, A III 5, P 11 - 14, V 9, Ll 29 - 35, L.tr. 5 1/2 / 5 1/2.

Generally, accepting Banister's (1973) revision:

D IV 7 - 9, A III 5, P 11 - 14, V 9, Ll 26 - 35, L.tr. 4 1/2 - 6 1/2 / 4 - 7 1/2.

One and a half to four and a half rows of scales were counted between the lateral line and the base of the ventral fin, and 12 - 14 rows of scales around the caudal peduncle in the whole area of distribution.

Geographical distribution of this species and relatively short time of the isolation of *B. intermedius* populations in Kito Pass have not brought, up to the present, any favorable conditions for the speciation process on the subspecific level.

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ORIBATID MITES OF THE SUPERFAMILY EUPHTHIRACAROIDEA (ACARI: ORIBATIDA) FROM INDIA

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Abstract. *Mesotritia clara* sp.n. is described and figured. Eigth other species of the superfamily Euphthiracaroidea from India are listed.

INTRODUCTION

In 1976 Dr. J. Błoszyk and Dr. J. Błaszak (Poznań, Poland) have collected comparatively large material of soil samples from Kashmir and Himalach Pradesh in northern India. Nine species of the superfamily Euphthiaracaroidea were found in this material. Special composition shows that studied area are situated near the boundary between Palearctic and Paleotropic regions with distinct predominance of palearctic species. One new species belongs to the genus *Mesotritia* and it is described in this contribution.

LIST OF LOCALITIES

IN-003, India, Kashmir, Domel, 75 km from Jammu to Srinagar, solitery *Pinus* sp. wood the slope, litter sifting, 4.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-004, India, Kashmir, way from Srinagar to Korgil, 20 km from Sonamarg, mixed forest with pine, spruce, fir, and walmut, litter, decaying wood, 6.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-009, India, Kashmir, near Khalsa, *Salix* sp. forest, litter, decaying wood and sheep excrements sample, 9.9.1976 leg. J. Błaszak, J. Błoszyk.

IN-016, India, Kashmir, Fotila defile, shrub on the slope, 4 493 m, litter sample, 11.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-027, India, Kashmir, near Sirbal, 13.9.1976, old pine tree, litter sifting, leg. J. Błaszak, J. Błoszyk.

IN-0028, India, Kashmir, 10 km from Sorbal, 13.9.1976, old walnut tree, *Sambucus* sp., litter sifting, leg. J. Błaszak, J. Błoszyk.

IN-0029, India, Kashmir, near Srinagar, south slope, detritus and litter sifting, 13.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-031, India, Kashmir, near Ramba, shrubs on south slope, grass, *Polygonum* sp., fern sifting, 15.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-033, India, Kashmir, near Ramba, sample of *Galium* sp., moos, fern and grass, 15.9.1976,leg. J. Błaszak, J. Błoszyk.

IN-034, India, Kashmir, near Batole, 128 km from Jammu, old pine forest, grass and litter sample, 15.9.1976,leg. J. Błaszak, J. Błoszyk.

IN-0035, India, Kashmir, 15 km from Kud, larch forest, litter sifting, 16.9.1976,leg. J. Błaszak, J. Błoszyk.

IN-045, India, Himalach Pradesh, near Mandi, vertical rock face, south-eastern slope, moos from face, 17.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-047, India, Himalach Pradesh, 30 km from Mandi, moss sample, 18.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-050, India, Himalach Pradesh, 6 km from Mandi, shrub on slope, dry litter and grass sample, 18.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-051, India, Himalach Pradesh, 35 km from Simla, young pine groove, southern slope, litter, grass and moss sifting, 20.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-053, India, Himalach Pradesh,20 km from Simla, shrubs on southern slope, wet litter sample, 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-054, *India*, Himalach Pradesh, 15 *km from Simla, oak groove, southern slope, litter, fern and moss* sifting 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-056, India, Himalach Pradesh, 15 km from Simla, pine forest, grass and litter sample, 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-060, India, Himalach Pradesh, 11 km from Simla, pine-larch forest, litter and soil sample, 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-063, India, Himalach Pradesh, 11 km from Simla, old larch forest, dry bed brook, litter and soil sifting, 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-064, India, Himalach Pradesh, 11 km from Simla, 1 800 m, larch forest, litter sample, 19.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-066, India, Himalach Pradesh, 11 km from Simla, 2 000 m, oak litter sifting, 19.9.1976, leg. J. Błaszak J. Błoszyk.

IN-067, India, Himalach Pradesh, 95 km from Ambala, old pine forest, dry litter sample, 20.9.1976, leg. J. Błaszak, J. Błoszyk.

IN-069, India, Himalach Pradesh, 90 km from Amabal, pine forest, litter sifting, 20.9.1976, leg. J. Błaszak J. Błoszyk.

IN-070, India, Himalach Pradesh, 10 km from Kalka, change-over between palearctic and tropical forest, oak *Ficus* sp., dry litter sample, 20.9.1976, leg. J. Błaszak, J. Błoszyk.

LIST OF IDENTIFIED SPECIES

Austrotritia gibba Bayoumi & Mahunka, 1979: IN-003 (9ex.)

Mesotritia dissimilis Hammer, 1977: IN034 (6ex.), IN-035 (13ex.)

Mesotritia clara sp.n.: IN-004 (1ex.), IN-027 (30ex.), IN-029 (6ex.)

Indotritia javensis (Sellnick, 1923): IN-066 (21ex.)

Rhysotritia cf.*penicillata* Mahunka, 1982: IN-051 (5ex.), IN-053 (7ex.) **IN-054(13ex.)**, IN-056 (6ex.), IN-060 (8ex.), IN-064 (3ex.), IN-066 (5ex.), IN-067 (1ex.)

Euphthiracarus cribrarius (Berlese, 1904): IN-029 (1ex.)

Rhysoptritia furcata Bayoumi & Mahunka, 1979: IN-051 (2ex), IN-070 (1ex.)

Rhysotritia ardua (C.L.Koch, 1841): IN-003 (20ex.), IN-004 (1ex.), IN-009 (4ex.), IN-028 (15ex.), IN-029 (13ex), IN-031 (11ex.), IN-033 (12ex.), IN-034 (1ex.), IN-035 (93ex.), IN-045 (3ex.), IN-050 (1ex.), IN-051 (2ex.), IN-053 (2ex), IN-054 (26ex.), IN-056 (1ex.), IN-060 (13ex.), IN-064 (9ex.), IN-066 (7ex.), IN-069 (1ex.),IN-069 (1ex.), IN-070 (13ex.)

Rhysotrtia rasile Mahunka, 1982: IN-027 (1ex.), IN-034 (24ex.), IN 035 (1ex.), IN 047 (8ex.), IN-067 (3ex.).

Mesotritia clara **sp.n.**

(Figs. 1 A-C, 2 A-B, 3 A-D)

D i a g n o s i s: 7 pairs of genital, 1 pair of anal, and 3 pairs of adanal setae, rostra setae in central part of aspis, setae on aspis erected, lateral carina not reaching t bothridial squama.

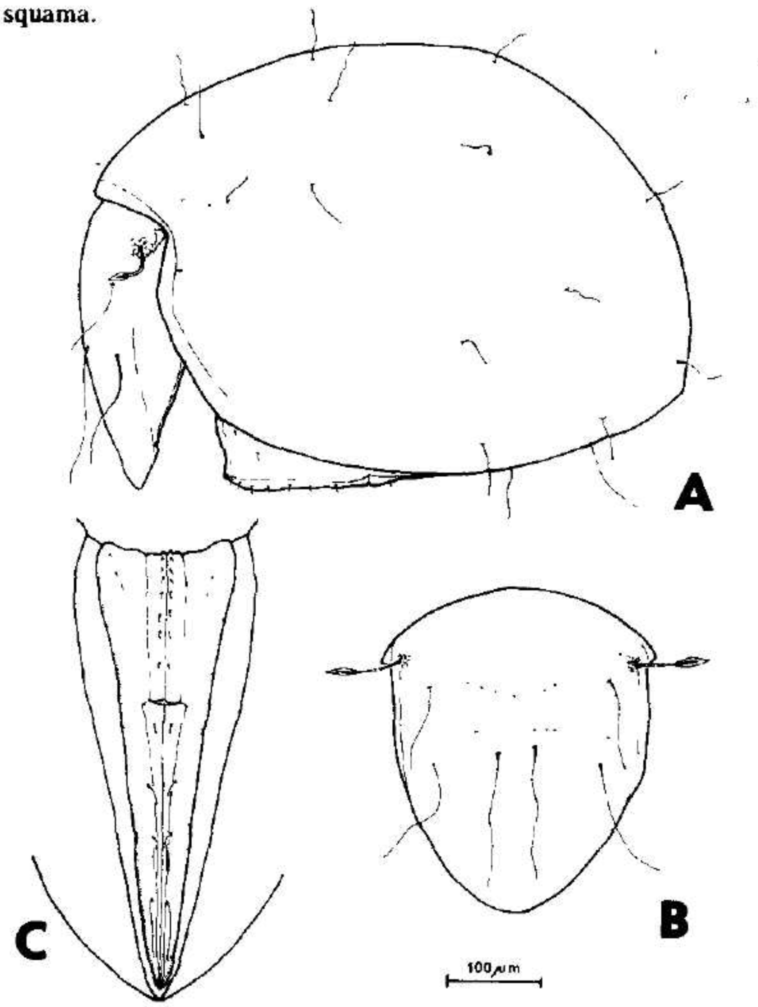

Fig. 1. *Mesotritia clara* sp. n., A - aspis and notogaster without legs in lateral view, B - aspis in dorsal view, C - anogenital region in ventral view. Scale 100 µm.

D e s c r i p t i o n: Length of aspis 320 - 378 µm, breadth of aspis 275 - 332 µm, length of notogaster 634 - 675 µm, height of notogaster 445 - 485 µm, breadth of notogaster 435 - 475 µm.Color reddish brown. Cuticle smooth, without thick layer of cerotegument and distinct surface structures.

Aspis (Figs. 1 A, B) with one lateral carina on each side, reaching anterior rostral margin, but not reaching to bothridial squama situated bellow bothridium. Comparatively long and smooth rostral setae not reaching rostral margin, situated in middle part of aspis smooth lamellar setae situated somewhat anteriorly, equal in the length to rostral ones smooth. Interlamellar setae shorter than lamellar ones, smooth, reaching to insertion of lamellar and rostral ones. Lanceolate sensillus ended by distinct hyaline clavus sharped on top, approximately as long as interlamellar setae, originating in small bothridium. Distance between interlamellar and lamellar setae approximately equal and 4x longer than distance between rostral ones. Exobothridial setae distinctly developed, but shorter than interlamellar ones. All setae on the aspis not cling to aspis surface. Two transverse lines situated between interlamellar setae, anterior one straight, posterior one bent.

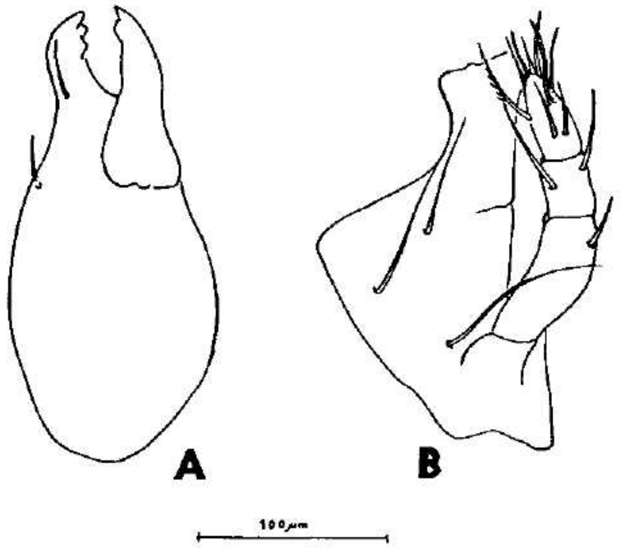

Fig. 2 ***Mesotritia clara* sp. n.**, A - left chelicera lateral view, B - **left palpus with rutelum, ventral view Scale** 100 µm

Notogaster (Fig. 1 A) oval, smooth, with 14 pairs of smooth, fine setae, seta d2 longest c3 shortest, but these differences undistinct. All notogastral setae erected and corrugated shorter than interlamellar ones. Anterior margin with distinct collar, posterior part with well developed fissura terminalis.

Anogenital region (Fig. 1 C) with short genital plate bearing 7 pairs of short and fine anal setae in anterior part, equal as genital ones; 2 pairs of adgenital setae, seta ag1 equal as genital ones, but ag2 3x longer; 3 pairs of smooth, longer adanal setae, seta ad1 the shortest, and ad 3 the longest adanal seta, ad3 approximately equal as lamellar ones All surface of this region smooth without distinct structures.

Chelicerae (F. 2 A) comparatively long and slender, with smooth surface and without Tragardh's organ. Size of digitus fixus 231x108 µm, digitus mobilis 95x43 µm, digitus fixus with 3 teeth and digitus mobilis with only 2 blunt teeth, short and smooth setae chb and cha equal long.

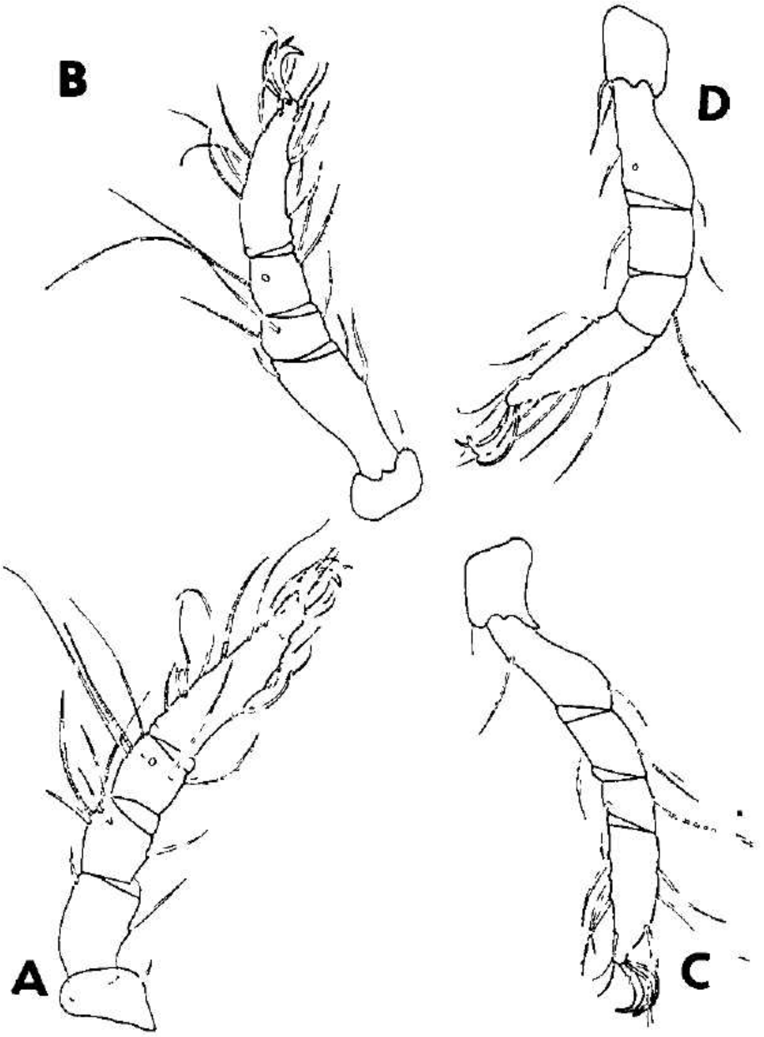

Fig. 3 *Mesotritia clara* sp. n., A - right leg I in antiaxial view, B - right leg II in antiaxial view, C - left leg III in antiaxial view, D - left leg IV in antiaxial view. Scale 100 µm

Palps (Fig. 2B) three segmented, chaetotactic formula 1-2-8 (1), genae with comparatively breadth blunt rutellum.

Legs (Figs. 3 A-D), short and robust, all tridactylous, chaetotactic formulae I 1-2-4/2/-5/1/-15/3/-3, II 1-3-3/1/-4/1/-12/2/-3, III 1-2-2/1/-2/1/-11-3, IV 2-3-2-1/1/-10-3. Solenidia ω 1-3 on tarsus I and ω 1-2 on tarsus II without accompanying setae.

Affinities: *Mesotritia clara* sp.n. belongs to *Mesotritia* species group with 7 pairs of genital setae, very similar is *M. piffli* Märkell, 1964, but it differs from the new species by the presence of 2 pairs of anal setae, complete lateral carina, shorter interlamellar setae, clung setae on the aspis, and by the anterior position of rostral setae (Märkell, 1964) *Mesotritia dissimilis* Hammer, 1977 differs from the new species by 2 airs of anal setae (Hammer, 1977). Very similar is *M. flagellata* Bayoumi & Mahunka, 1979 but this species has only 6 pairs of genital setae, and shorter sensillus (Bayoumi & Mahunka, 1979).

Locus typicus: IN-027 (30ex.)

Further localities: IN-004 (1ex.), IN-029 (6ex.)

Types: Holotypus (Ho-13.9.1976 - IN-027) in ethanol and 26 paratypes one an slide and others in ethanol are deposited in authors' collection in the Institute of Soil Biology, Czechoslovak Academy of Sciences, Česke Budějovice, 10 paratypes in ethanol are deposited in the Institute of Biology, A Mickiewicz University, Poznań Poland.

Acknowledgements

I thank to Dr. J Błoszyk (Poznań, Poland) for the material and Dr J Rusek DrSc. (České Budějovice, Czechoslovakia) for critical reading of the manuscript

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FIRST RECORD OF LEPTOIULUS BRAUERI WEBERI (DIPLOPODA) FROM CZECHOSLOVAKIA

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Abstract. The first record of the millipede *Leptoiulus braueri weberi* Verhoeff, 1927 from Czechoslovakia is given. The male genitalia are described and figured and the geographical distribution is discussed

From the materials of Dr. Růžička's long-term pitfall traps (Růžička, 1988 and unpublished data) I obtained several millipedes of which one male of *Leptoiulus braueri weberi* Verhoeff, 1927 was the most interesting one. It was trapped in the rock debris formation of the Vydra river valley in the Šumava Mountains in South Bohemia (faunistic square code 6947) during the trapping period from 4 August 1984 to 28 July 1985.

This subspecies was described from Grafenau (Bavaria, Federal Republic of Germany, faunistic square code 7146) as *Leptoiulus weberi* Verhoeff, 1927. Attems (1949) introduced it without explanation as a subspecies *Leptoiulus braueri weberi*. Strasser (1959) analysing Verhoeff's "*braueri*-group" confirmed its subspecies statute.

The trapped male is approximately 20 mm long, maximum 1.4 mm wide, with 52 body segments and 86 pairs of legs. The colour of the alcohol fixed animal is ochrebrown, with darkbrown head, the anterior 9 - 10 and the 3 posterior segments. The legs are brown. In contradiction to other representatives of the subgenus *Leptoiulus* Verhoeff, 1929, the coxa of the first pair of legs (Fig. 1) is rounded without tooth, the prefemur is distinctly separated from other parts of legs. The remaining part of telopodit is slender and closer to its basis. The second pair of legs is characterized by the presence of clushions on the postfemur and tibia (Fig. 2). The morphology of genitalia is in agreement with the original description (Verhoeff, 1927). The anterior and posterior solenomerite projections converge slowly to one another (Fig. 3). The posterior one is bulky and broad, and it bears two branches on its apex. The anterior branch is larger. The medial projection of the solenomerite is toothlike and short.

Verhoeff (1927) collected this subspecies under moss on granite blocks and under the bark of trunks. The habitat in the Šumava Mountains is practically analogous.

Leptoiulus braueri (sensu Strasser, 1959) is a high mountain species which is distributed especially in the Southern Alps, while in the Northen Alps it was collected in few places only (Kurnik & Thaler, 1985). The subspecies *Leptoiulus braueri*

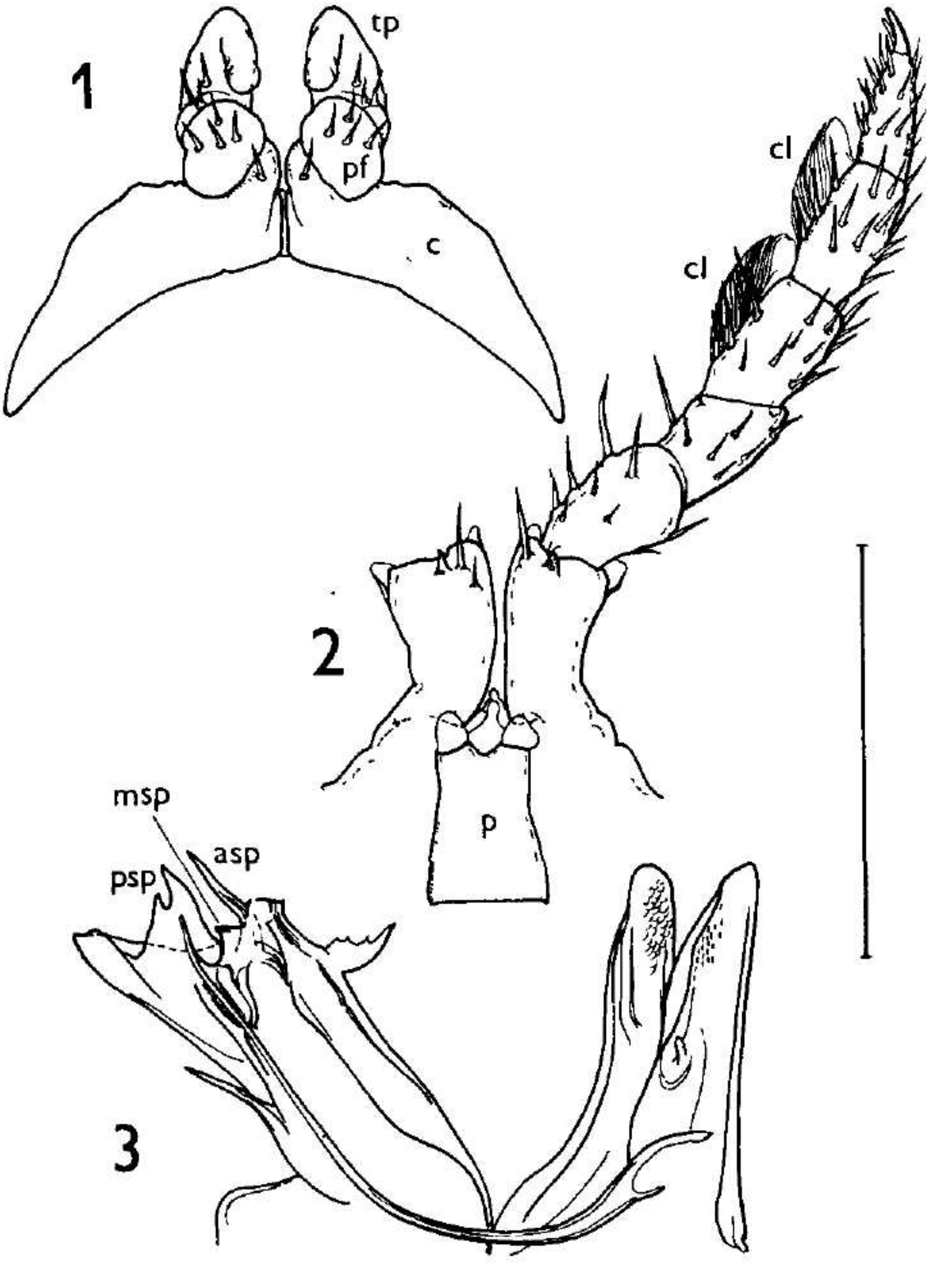

Fig 1 First pair of legs of male (posterior view), c - coxa, pf - prefemur, tp - telopodit Fig. 2 Second pair of egs of male (posterior view), cl - clushion, p - penis Fig 3 Internal profile of the right gonopods. Solenomerite rojections asp - anterior, msp - medial, psp - posterior Scale 0 5 mm

weberi was found outside the locus typicus in Bavaria, in the Italian Dolomites (Southern Alps, Grodner Tal - Verhoeff, 1929; Hohe Geisel - Attems, 1949) only. This subspecies, practically as sole member of the „*braueri* - group", penetrates to the north outside the alpine region. The Šumava Mountains are the fourth locality of the subspecies and represents the northernmost point of its distribution. The Vydra river valley is about 800 - 820 m a.s.l. Gulička (1985) presupposed the occurrence of this subspecies in Bohemia. This record acknowledged his conjecture. *Leptoiulus braueri weberi* is a new species for the Czechoslovak fauna.

Acknowledgement

I thank Dr. V. Růžička, Institute of Landscape Ecology, C.A.S , České Budějovice, for the millipide materia

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BOOK REVIEW

Coombs I., Crompton D. W. T.: *A Guide to Human Helminths.* Taylor and Francis, London
New York, Philadelphia 1991, 162 pp Price Lstg 22 50

Three hundred and forty two species of helminths, wich have been found in association witd human hosts are listed in this book. Many of these species are highly prevalent and recognized as agents of serious diseases Other speciese of worm have occasionally or sporadically been observed in contact with human tissue, usuall after investion of larval stages of helminths in intermediate or paratenic hosts, as are molluscs, fishes amphibians or snakes. Introductory chapter includes a tabular review of estimates of the numbers of case (milion) of common human helminthic infections. In the chapter concerning the scheme of classificatio systematic review of all helminths considered to infect humans according to the zoological system with famili and specific names is presented Representatives of the phylla Plathelminthes, Nematoda, Nematomorpha and Acanthocephala are discussed here. In the chapter providing a list of human helminths entries are presented i a standard format containing the specific name, definitions of host(s), intermediate host(s), paratenic host(s) geographical distribution, location(s) of the helminth species in the human host, name of disease recomended by CIOMS/WHO (1987), common synonyma, mode of actual or asssumed transmission to the human host and references to recent or detailed reviews. The index contains specific names of all helminths under discussion.

This publication contains an original and updated catalogue of helminths which have been observed i human host It represents a comprehensive reference manual and is highly recommended for students taking parasitology and medical zoology courses and for specialists in infectious and parasitic diseases.

J. Jir

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ABSTRACTS OF PAPERS

presented at the 20th annual conference of the Protozoological section of the Czechoslovak zoological society. JÍROVEC DAYS held in Špindlerův Mlýn, 18-20 June 1990

Ubiquity of coccidia in large-scale cow-houses

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The prevalence of coccidia of genus *Eimeria* in livestock was determined by coprological examination of animals in different large-scale cow-houses. Due to careful coprological examinations even very mild infections were detected. Out of 13 369 animals examined coprologically, 66.8 % were positive for coccidia of following species *Eimeria alabamensis* was found at 6.8 % of the animals examined, *E. auburnensis* at 17.5 %, *E. bovis* at 42.4 %, *E. brasiliensis* at 0.4 %, *E. bukidnonensis* at 5.9. %, *E. cylindrica* at 8.0 %, *E. ellipsoidalis* at 23.5 %, *E. subspherica* at 10.3 %, *E. wyomingensis* at 0.4 %, *E. zuernii* at 40.2 % In the vast majority of animals positive for coccidia the intensity of infection was very low

Extremely high prevalence of coccidia was detected in mother cows Of 669 cow-mothers examined, 97.7 % was infected with coccidia Mother-cows transfer coccidia into new buildings. With the exception of *E. wyomingensis* which was not found in new calving pens, there was no significant difference between the occurrence of coccidia in old calving pens and in the new ones. Calves become infected from their mothers. The intensity of infection increases after calves being transferred to plant nutrition, when clinical coccidiosis occurs frequently. Coccidia were found in all studied buildings housing diverse technologies used for feeding of animals and cleaning their stables. Of 700 animals in pasture, coccidia were found at 92.7 % A large amount of oocysts was found in the zoobuses. In the circumstances of frequent animal transports in large-scale technologies, a wide spectrum of coccidian species is being transported permanently

Influence of attenuated (embryo-adapted) Eimeria tenella on lymphocyte blastogenesis in vitro

P. Bedrník & V. Karlach, Research Institute of Feed Supplements and Veterinary Drugs, CS-254 49 Jílové Near Prague

It has been already shown that infection of chickens with virulent strain of *Eimeria tenella* damages lymphoid organs and alters the responsiveness of lymphocytes to mitogens and to antigens prepared from this parasite Schatschneider & Olkonen, Proc 3rd All-Union Congress of Protozool., Ac Sci of Lithunian SSR, Inst Zool. and Parasitol. Vilnius, 1982, p. 389, Rose & Hesketh. *J Protozool* 31: 549-553,1984). Influence of infection with an attenuated (embryo-adapted) line of *E. tenella* (Bedrník et al., Av. *Path*. 18: 255-264, 1989) on these parameters was followed in this study.

Hybro cockerels 2-4 weeks old were used Each experimental group consisted of 5 chickens (in Exp. No. 1 2 chickens). In the first serie of 4 experiments they were given $1x10^4$ oocysts of either a virulent strain (Exp. No 1 and 2) or the attenuated line of *Eimeria tenella* (Exp. No.3 and 4). After two weeks they were given $1x10^5$ oocysts of a virulent strain of *E.tenella* Five days later peripheral blood leucocystes (mainly lymphocytes) were isolated from blood taken by cardial puncture In the 5th experiment the chickens were given $1x10^5$ oocysts of the virulent strain or of the attenuated line of *E. tenella* Lymphocytes were isolated on days $7_{(7)}$ and $14_{(14)}$ post inoculation.

The isolated cells cultured in RPMI 1640 medium with 10% calf serum were stimulated by phytohemaglutinin.

At 24 hours the cultures were pulsed with 1 u Cl 3H-thymidine and at 48 hours they were harvested and the radioactivity was measured Blastogenic response of cultured lymphocytes was evaluated with help of a stimulation index (SI) ie.. mean counts per minute (cpm) of stimulated cultures divided by cpm of nonstimulated cultures.

Blastogenic response of lymphocytes isolated from chickens inoculated with virulent *E tenella* (Exp. No /SI-1/3.8, 2/12.05, 5_7/1.58, 5_{14}/1.83) was lower than of uninoculated chickens in both types of trials (Exp. No./SI-1/11.5, 2/25.8, 3/2.65, 4/2.29, 5_7/2.14, 5_{14}/2.04. Blastogenic response of lymphocytes isolated from chickens inoculated with attenuated line of *E. tenella* (Exp No./SI-3/3 10, 4/2 93, 5_7/2 14, 5_{14}/2 09) was higher or the same as that of uninoculated control chickens (2 5, 2.3, 2.0). The attenuated line lost their negative influence on blastogenesis and is therefore suitable for use in a live coccidiosis vaccine

Antibodies in the sera of laboratory rats infected with Entamoeba histolytica

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Sera of young laboratory rats intracaecally inoculated with *Entamoeba histolytica* were examined by ELISA using soluble *E histolytica* antigen, hyperimmune rabbit serum against rat immunoglobulin and swine anti rabbit conjugate labelled by peroxidase. Specific antibodies appeared three weeks post infection Examined sera were divided into four groups

1 - sera of healthy control animals (n = 30)

2 - sera of inoculated animals with negative record of amoebae during autopsy (n = 30)

3 - sera of animals with positive record of amoebae in the caecal content, without of the caecal mucosa (n = 12)

4 - sera of animals inoculated with virulent strains - positive records of amoebae in caecal mucosa (n = 12)

The sera of the first two groups yielded negative results with average optical density 0 33 and 0.41 respectively in dilution 1:200. The average optical density of the third group were 0 8 and 30 specimens reached the positivity limit. In the fourth group the average optical density were 1.1. and all but one samples were positive. Positive sera were tested by enzyme linked electroimmunotransfer blots, using the same sandwich system. Obtained blots were compared with blots of the same antigen treated by human sera and anti-human conjugate. In the specific area of 36 - 44 kD only three fractions precipitated with the rat sera instead of five precipitating with the human sera

It was proved that nonvirulent strains of *E histolytica* surviving in the caecal content of rats are able to cause the production of specific antibodies

The importance of zymograms for characterization of Giardia intestinalis strains

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Thirteen *Giardia intestinalis* strains were examined by enzyme electrophoresis. Five of them were reference strains from the laboratory of Prof. Meyer (Oregon Health Sciences University, Portland, USA) and eight strains were isolated at the Institute of Parasitology (Czechoslovak Academy of Sciences) in České Budějovice. All of the thirteen strains were cultivated under the same conditions. Isoenzyme analysis was performed by the thin layer starch gel electrophoresis. The running conditions and buffer employed were the same for all of the runs. The following enzymes were detected after electrophoresis. malic enzyme (ME, EC 1.1.1.40), esterase (EST. EC 3 1 1 1), glucose-6-phosphate dehydrogenese (G6PD, EC 1.1 1 49) and glucose phosphate isomerase (GPI. EC 5 3.1 9) The results of the electrophoretic analysis showed that only one strain was clearly different of the other twelve strains, this organism differed in all isoenzymes. This difference correlated neither with an animal host nor with a clinical picture of human disease

During long-term cultivation of one human isolate in vitro the change of zymogram was recorded. The strain had showed quite different pattern of all enzymes tested, but after four-month cultivation gained the same pattern as the other twelve strains presented. This change has been observed repeatedly, the cryopreserved stock of the same isolate had shoved the original zymogram, but after recovery and three-month cultivation started to change. This change might be explained by the competition of clone populations and may have a great importance in strain zymograms evaluation.

Extrasporogonic proliferative blood developmental (EPBD) stages (Myxozoa: Myxosporea) from previously unexamined freshwater fish species in Bohemia and Moravia (Czechoslovakia)

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EPBD stages of Myxosporea have been described in Czechoslovakia except carp (*Cyprinus carpio*) only for 3 fish species: gudgeon (*Gobio gobio*), tench (*Tinca tinca*) and roach (*Rutilus rutilus*).

These stages were determined to fall in the genera of *Sphaerospora, Chloromyxum* and *Myxidium*

In our work we have described EPBD stages from 11 fish species originating from ponds and rivers in the regions of Bohemia and Moravia (Czechoslovakia). These species include goldfish (*Carassius auratus gibelio*), rudd (*Scardinius erythrophthalmus*), bream (*Abramis brama*), chub (*Leuciscus cephalus*), bleak (*Alburnus alburnus*), ruffe (*Gymnocephalus cernuus*), perch (*Perca fluviatilis*), grayling (*Thymallus thymallus*), brown throut (*Salmo trutta fario*), burbot (*Lota lota*) and bullhead (*Cottus gobio*). It is suspected that the existence of these stages in pike (*Esox lucius*) and eel (*Anguilla anguilla*) exist but have not yet been determined

In our evaluations all of the early EPBD stages of *Myxosporea* have not been observed in the blood of bream (*Abramis brama*) but are presumed to exist In the blood of perch (*Perca fluviatilis*) and ruffe (*Gymnocephalus cernuus*) only early stages have been found

No correlation has been obtained between the seasons of the year and occurrence of EPBD stages of *Myxosporea*

Enzyme electrophoresis and species differentiation of Eimeria parasitizing the domestic fowl

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Eimeria species isolated from the field can be identified by comparison of mobility of their glucose phosphate isomerase (GPI) and lactate dehydrogenase (LHD) enzymes with those from reference laboratory strains in starch gel electrophoresis. Since there are seven species of *Eimeria* in domestic fowl and in some of them different populations with different enzyme profiles may occur (Shirley, *Proc Georgia Coccidiosis Conf.*, Univ. Georgia, p 3, 1986), the inclusion of all distinct strains as reference controls into each electrophoresis would be impractical. Therefore we suggest to include into each experiment one reference strain only and to do the species differentiation of new isolates according to relative position of found GPI and LDH bands to those of the reference strain. We have found that, supposing standard gels and buffers are used, positions of enzyme bands of particular species in experiments differing in other conditions, such as voltage, time or use of thin or thick gel, are in constant ratio to positions of reference bands This fact enables to compare various experiments supposing that in each of them the same reference strain was used In order to enable comparison of different experiments we calculate for each studied enzyme band its standardized distance from start (S_x) using the following formula: $S_x = S_r \cdot A_x/A_r$, where S_r is standardized distance of the reference band and A_x and A_r are actual distances of the studied band and the reference one from start In our experiments, a strain of *E. tenella* characterized by GPI-9 and LDH-8 has been used as a reference control and we have defined S_rGPI-9 = 2.54 mm and S_rLDH-8 = 3.62mm. Mean S_x of found enzyme bands of other species were as follows: *E. mitis* (44 experiments): LDH-1 = 3.4±0 19, GPI-10 = 2 42±0 24, GPI-2 = 2 86±0.19, *E.acervulina* (68 exp): LDH-2 = 1 93±0 16, GPI-7 = 2.09±9.15, GPI-8 = 1.46±0 15, *E. praecox* (33 exp): LDH-5 = 1.55±0.2,GPI-5 = 4.15±0.2; *E. necatrix* (3 exp): LDH-7 = 2.46±0.06, GPI-3 = 2 55±0.18, *E tenella* (5 exp) GPI-1 = 2.22±0.19; *E. brunetti* (14 exp): LDH-4 = 4.46±0.21, GPI-6 = 4.56±0 31, *E maxima* (17 exp.): LDH-3 = 2.02±0.18, GPI-4 = 3.18±0.19

Pathological and histochemical constitution of selected organs of gerbils experimentally infected with Entamoeba histolytica

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Intestinal, hepatic and kidney tissues of gerbils infected by *E. histolytica* strains HM 1 were 21 days PI examined by the classical histopathological methods as well as by histochemical ones, enabling to evaluate the functional state of organs. The material originated from animals successfully infected but without tissue invasion of amoebae. Obtained results were compared with the material originated from healthy uninfected gerbils. In caecal mucosa of infected animals the metaplasia of surface epithelium, decreased number of goblet cells as well as the defect of intestinal mucosa was recorded. It was expressed by the decrease of dipeptidylpeptidase IV and 5 nucleotidase activities and by the increase of acid phosphatase activity, which may be associated with the increase of lysosome enzymes.

Defects of glomeruli were observed in kidney tissues, that can be characterized as membranous glomerulitis or diffuse glomerulonephritis. Functional defect was characterized by the decrease of dipeptidylpeptidase IV activity.

Liver of infected animals were affected by the surface fibrosis and the hepatocyte vacuolization. The dipeptidylppeptidase IV and hydroxybutyratdehydrogenase activities were decreased and the activity of lysosome enzymes (ß-D-glucuronidase) was increased. These changes might be related with tissue damage caused by circulating immunocomplexes.

Concurrent infections of extra- and intracytoplasmic fish-coccidia

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In several specimens of chub (*Leuciscus cephalus*), roach (*Rutilus rutilus*), white bream (Blicca bjoerkna), and gudgeon (*Gobio gobio*), concurrent infections of extracytoplasmic (E) and intracytoplasmic (I) coccidians were found.

Some of the infected fish have been kept in laboratory until they discharged faces or casts. Then they were immediately killed and processed for routine histology. Coccidians in feces were allowed to sporulate in tap water.

Comparison of oocysts recovered from feces of fish with E and/or I infections lead us to conclusion that E stages belong to a different species than stages with I localization. Following species have been determined: *Goussia pannonica* (E) and *G. balatonica* (I) from white bream, *G. janae* (E) and *Goussia* sp. I (I) from chub, *Goussia* sp. II. (E) and *Goussia* sp. III (I) from roach, and *Goussia* sp. IV (I) and *Gousia* sp. V (E) from gudgeon.

In the populations studied mild to heavy infections were documented. Preliminary data suggest the seasonal occurrence of these parasites.

Filter-feeding rates of three activated-sludge ciliates

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The relationship between ciliate feeding rate (measured using fluorescently labelled bacteria) and ciliate growth rate was studied in three differently loaded continuous-flow systems. There were used ciliate stock cultures of *Colpidium campylum* (Stokes, 1886) clone C-1-72/Lg, *Vorticella microstoma* Ehrenberg, 1830 clone 56-84/Mc and *Cyclidium* sp.

Both *C. campylum* and *V. microstoma* had similar mean clearance rates of 100 $nl.h^{-1}$ (total) and 200 $nl.h^{-1}$ for the most active 10% of individuals. Distribution of clearance rates of *C. campylum* was non-normal (sometimes was only 10% of active ciliates). A minute ciliate *Cyclidium* sp. reached clearance rate only up to 17 $nl.h^{-1}$. For each ciliate species the linear dependence of mean clearance rate on the division rate was proved. The minimum value supported growth was predicted from the extrapolation of the relationship to be 14 $nl.h^{-1}$ (*C. campylum*), 23 $nl.h^{-1}$ (*V. microstoma*), and 1 $nl.h^{-1}$ (*Cyclidium sp.*). The minimum mean volume of an actively growing population could be predicted from the linear relationship, too, except *Cyclidium* sp. (2000 µm^3 and 6900 µm^3 respectively). Linearity of the relationship between measured growth and feeding was more evident deriving bacteria uptake rate. It was proved both for *Cyclidium* sp. culture with very low bacteria concentration (uptake up to 200 bacteria.$cell^{-1}.h^{-1}$), and for *V microstoma* in the culture with bacterial flocs (uptake up to 2000 bacteria.$cell^{-1}.h^{-1}$). Dispersed bacteria concentration had to be used for calculation However, such calculated values were not significant for *C campylum*. Selection of used labelled bacteria or predation on bacterial flocs could be supposed according to observed feeding behavior changes.

Some aspects of intranuclear development of two bird coccidia

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The life cycles of two geese coccidia, *Eimeria stigmosa* and *E hermani*, were studied by means of light and electron microscopy. The endogenous stages were found in a very unusual position inside nuclei of intestine epithelial cells We have observed that all endogenous stages possess a distinct parasitophorous vacuole Numerous stages of different developmental level were frequently found in one nucleus Each specimen forms its own parasitiphorous vacuole Asexual generations are formed by ectomerogony During formation of merozoites in a meront, infected nucleus shifts towards the periphery of the host cell After formation of merozoites the nuclear and cytoplasmic membrane of the cell is ruptured Merozoites are released and enter the intestinal lumen.

During the development of endogenous stages the invagination of caryoplasm of the host nucleus into the body of a meront was observed. As the caryoplasm is reducted during the development of asexual and sexual stages we suppose that coccidia with intranuclear type of the development utilize the nuclear caryoplasm of the host cell for their nutrition

A preliminary study of monoxenous coccidia in passerine birds

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Fecal samples of 170 birds belonging to 38 species and 25 genera were examined Oocysts were found in 48% of examined birds, i e in 81 individuals of 29 species of 18 genera.

Most of the species found belonged to the genus *Isospora*. Moreover, two other genera were found *Caryospora* in *Acrocephalus palustris* and *Eimeria* in *Sylvia borin* Due to dubious descriptions of some avian coccidia in literature, the species determination was possible only in some cases

The examination of a population of *Hippolais icterina* showed that some birds became infected already as nestlings, probably via food contamined by infected adults.

Are fish trypanosomes diploid?

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The diploidy of fish trypanosomes (*Trypanosoma* sp) grown axenically in culture is proposed on the basis of electrophoretic mobility studies of malic enzyme (ME) in polyacrylamide gel. Three types of ME enzyme patterns were observed: two single-banded (in strains originating from rudd and tench) and one three-banded (in strain originating from bream) ME is dimeric in trypanosomes and thus the two single-banded patterns may represent homozygous and the three-banded pattern heterozygous allelic arrangement. This finding is consistent with the idea of diploidy in fish trypanosomes

Kinetoplast DNA of fish trypanosomes

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Kinetoplast DNA (kDNA) was isolated from axenically cultured fish trypanosomes by means of differential centrifugation followed by chloroform-isoamylalcohol extraction. The restriction analysis revealed the existence of interlocked minicircles and maxicircles with the approximative size of 2 kbp and 30 kbp, respectively. As seen from the comparison of the electrophoretic restriction patterns of kDNA of 7 strains isolated from 5 different host species, the polymorphism of minicircle structure was lower than usually found in trypanosomatids. The maxicircles gave distinct, but obviously related electrophoretic patterns. Combined together these two pattern types allowed an unambiguous strain identification.

The organization of kDNA into a great network, the existence of mini- and maxicircles, and their sizes were subsequently corroborated by electron microscopy using the Kleinschmid's cytochrom c spreading technique.

Association of ciliates in raw sewage

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Raw sewage is an environment showing nearly identical characteristics on the whole world. The BOD_5 values range between 50 and 400 mg l^{-1}, there is present dissolved oxygen in amounts decreasing from about 4.0 to 0.0 mg l^{-1}, so that the milieu is microaerobic. Šrámek-Hušek (1958) called the association of ciliates in this polysaprobic environment as *Colpidietum colpodae*. His list proved to be correct and only small corrections are made in the following table.

Taxon	o	b	a	p	i	I_i	S_i	common abundance
Colpidium colpoda (Ehr.)Stein	-	-	+	8	2	4	4.2	4-5
Colpidium campylum (Stokes) Breslau	-	-	+	7	3	4	4.3	4-5
Glaucoma scintillans Ehr.	-	-	-	7	3	4	4.3	4-5
Paramecium caudatum Ehr	-	-	7	3	-	4	3.3	2-3
Paramecium putrinum Clap. et Lachm	-	-	-	6	4	3	4.4	4-5
Hemiophrys bivacuolata f. polysaprobica Šrámek-Hušek	-	-	-	6	4	3	4.4	2-3
Acineria incurvata Duj.	-	-	-	5	5	3	4.5	1-3
Cyclidium glaucoma O F Muller	-	-	8	2	-	4	3.2	2-3
Cinetochilum margaritaceum Perty	1	3	3	3	-	1	2.8	1-2
Tetrahymena pyriformis (Ehr.)Lwoff	-	-	-	5	5	3	4.5	2-3
Amphileptus claparedei Stein	-	1	8	1	-	4	3.0	1
Cohnilembus pusillus Quennerstedt	-	+	6	4	+	3	3.4	1-2
Colpoda steinii Maupas	-	-	2	8	+	4	3.8	1
Colpoda inflata Stokes	-	-	5	5	+	3	3.5	1
Tachysoma pellionella (O F.Mulller)	1	2	3	4	+	1	3.1	1-2
Vorticella microstoma Ehr.	-	-	-	8	2	4	4.2	3-4
Vorticella hians Fauré-Fremiet	-	-	+	5	5	3	4.5	1-2
Vorticella putrina O.F.Muller	-	-	-	8	2	4	4.2	2-3
Vorticella turgescens Stiller	-	-	-	5	5	3	4.5	1-2

Explanations: o = oligosaprobity, b = beta-mesosaprobity, a = alpha-mesosaprobity, p = polysaprobity, i = isosaprobity (anoxic up to anaerobic), I_i = indicative weight of species, S_i = individual saprobic index, common abundance for polysaprobity within the scale 1 to 5.

Ultrastructures of spores of Vairimorpha plodiae in Galleria mellonella

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Ultrastructures of two types of mature spores of the microsporidian *Vairimorpha plodiae* infecting larvae of *Galleria mellonella* are compared. The uninucleate octospores have an electron dense exospore 0.04 µm thick and an electron lucent endospore 0.12-0.15 µm in thickness. The polar filament is coiled in the posterior part in 8 coils, of which usually 3-4 are deposed in a second row. The binucleate elongate spores have a very thin electron dense exospore and a rather thick translucent endospore with a densely adhering germ in the interior. The polar filament is coiled laterally on the spore wall in 12-15 coils in one row, slightly oblique to the longitudinal axis. The polaroplast is well developed in its lamellar and alveolar parts occupying a space of 0.6-0.9 x 0.6 µm and two adherent nuclei are localized longitudinally in the germ. A rich dense deposit of ribosomes on lamellae of ER characterizes an intensive synthesis of proteins which are used in the posterosome. This is a spherical body enclosed for some time in concenteric lamellae. During the formation of the polaroplast it consists of a network of communicating minute cisternae. Some spores are activated, with the straight part of the polar filament being shifted to one side of the spore. In activated spores the polaroplast has a vacuolated structure. In protrudes into the posterior part of the spore as well as into the thin area of the endospore through which the polar filament will be released. Some empty spores with regular oval wall are remains of spores involved in the spread of the infection inside the host. Secretions which are typical for octosporous stages of *Vairimorpha* are minimal in this material.

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BOOK REVIEW

Begon M, Harper J. L. & C. R. Towsend: *Ecology: individuals, populations and communities.* 2nd edition. Blackwell Sc. Publ. Oxford 1990, 945 pp.

Koncepčně tato učebnice navazuje na manuál populační ekologie Begon M. & M. Mortimer 1981: Population ecology: A unified study of animals and plants. Blackwell Sc. Publ. Oxford.

Kapitola zabývající se populacemi zde však byla doplněna úvodní částí o vztahu organismu a prostředí, o podmínkách a zdrojích, o životních cyklech, migracích a distribuci. Část závěrečná pojednává podrobně o vztazích ve společenstvu.

Autoři pojednávají předmět studia ekologie přísně biologicky a úspěšně se vyhnuli zatížení ekologické učebnice problematikou ochrany životního prostředí člověka. O to větší prostor je věnován čistě biotickým vztahům. Dokumentační materiál je velmi rozsáhlý a shrnut v názorných diagramech a tabulkách. Při studiu však nemá čtenář pocit zahlcení daty, ale ocení velkou informovanost autorů.

Na učebnici oceňuji především integrální přístup k živé přírodě, kde autoři při ilustraci jednotlivých vztahů či zákonitostí volí cílevědomě příklady jak z říše živočišné tak rostlinné, autotrofní organismy nepojednávají podvědomě jen jako rostliny kvetoucí, ale používají hojně příklady i ze skupin nižších rostlin včetně řas. Podařilo se jim tak setřít často zdůrazňovaný rozdíl mezi ekologii rostlin a živočichů a naopak ukázat, že kromě zcela specifických vlastností existuje rozsáhlá oblast podobností či shodného řešení téhož problému i u taxonomicky vzdálených jednotek.

Naopak lze knize vytknout minimální informace z oblasti ekologie prokaryontních organismů. Autoři používají matematického aparátu k vyjádření zobecňujících poznatků střídmě a ne samoúčelně. Používané matematické modely jsou jasně vysvětleny a jejich význam pro nové poznání v ekologii není přeceňován. Chápu je jako metodický nástroj k utřídění poznatků, k simulaci teoretických experimentů či k prostému popisu určitého jevu.

Kniha je doplněna rozsáhlým aparátem ekologické literatury a funkčním druhovým a věcným rejstříkem. Všechny tato vlastnosti ji řadí mezi nejlepší učebnice ekologie posledních deseti let. Je neodmyslitelnou součástí knižních fondů universit v celé Evropě i na severoamerickém kontinentu. Bylo by žádoucí, aby se stala hlavním zdrojem informací pro studenty ekologie i u nás.

V. Kořínek

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